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The Massachusetts Medical Society

(Section of Radiology and Physiotherapy)

DIATHERMY IN MEDICINE*

BY WILLIAM D. MC FEE, M.D.

THE employment of high frequency currents in the treatment of disease as first suggested by Tesla about the year of 1890 has continued unremittingly, until today it holds an indispensable position in the field of medicine and surgery.

Diathermy is the accepted term for the method of localizing heat in the tissues of the body by electrical currents of high frequency. The name is derived from two Greek words meaning "to heat through". The principle of diathermy is based upon the passage of an electric current through substances which offer a resistance to its flow, with the result that this electrical energy is transformed into caloric energy or heat. Since the human tissues offer a high resistance to the flow of electric currents through them, the principle involved is very obvious to even those without any special electrical training. In order to force currents through tissues, high voltage (electrical pressure) is required, and it is evident that the application of high voltage must be made without pain, electrical shock, or other disagreeable sensation to the patient. This is accomplished by employing currents whose polarity changes or alternations are of a very high frequency. By this we mean a frequency of 1,000,000 cycles or more per second which is in contra-distinction to low frequency currents which are of the order of from 25 to 500 cycles per second and which are generated by power houses for commercial use. On account of the very rapid alternations of the currents, these high frequencies make impossible any undesirable reactions in the nerves and muscles, and the only effect felt by the patient is that of an even heat generated in the tissues; this then explains how it is possible to employ electric currents at high voltages to heat tissues.

The designing of the apparatus for this purpose is a problem in electrical engineering and has to do with electrical properties such as resonance of oscillating circuits, oscillation frequency, spark frequency, damping, inductances, and capacities which are purely electrical matters into which time will not permit the present discussion to go. However, a brief and sketchy description of the method of producing high frequency currents may not be out of place.

Since it is required that we have available a source of high voltage to start with, it first becomes necessary to have a high voltage step-up transformer to raise 110 or 220 volts to from 10,000 to 35,000 volts. The primary winding of the transformer consists of a few hundred turns of wire, while the secondary is made up of some thousands of turns of wire. The line current at 110 volts is fed into the primary and by induction is carried into the secondary winding which steps up the voltage in proportion to the ratio of turns between primary and secondary. It should be added that with this increase in voltage the current is decreased in inverse proportion.

The high voltage current from the secondary terminals is now fed into the Leyden jars (which are condensers) which are connected together on their opposite sides through a winding of a few turns of heavy wire known as the D'Arsonval winding. This winding has the electrical property known as Inductance while the Leyden jars have that electrical property known as Capacity. A spark gap is placed across the transformer secondary wires that go to the Leyden jars, just ahead of the jars. The spark gap, Capacity, and Inductance now comprise an oscillating circuit which will cause currents fed into it to oscillate at a high frequency characteristic of this particular circuit which in turn depends on the specific electrical values of these component parts.

The current for Diathermy and Electro-coagulation is taken off from the circuits at the beginning and end of the D'Arsonval winding; in other words, we "pick off" this current from this winding as it flows through it. The principle function of the D'Arsonval winding, however, is to balance the oscillating circuits for a certain frequency and state of resonance. The function of the spark gap is to provide a medium across which the Leyden jar discharges can take place. It also acts as a regulator of

*Read at the annual meeting in Springfield, Mass.

the intensity of the high frequency currents generated, by increasing or decreasing the space between its points.

From the foregoing it is seen that the function of the transformer is to step up the voltage, while it remains for the oscillating circuits to set this high voltage low frequency current in oscillations of high frequency.

The practical use of diathermy as a measure in the treatment of disease dates from about the year 1898 when D'Arsonval of Paris reported the results of his studies of high frequency currents. From this time until 1917 occasional reports were presented before medical meetings which were mostly references to the bi-polar high frequency application not called by any particular name. About this time the United States Government, under the able direction of Dr. Frank B. Granger of Boston, began the treatment of its wounded and disabled soldiers in departments of physiotherapy established in the Army hospitals, which departments were thoroughly equipped with apparatus and with a force of trained workers properly to administer treatments.

Early in this war work it was recognized that the bi-polar high frequency application producing heat penetration, and now known as diathermy, could be used to advantage in the treatment of many of the disabling conditions found in these men. Various methods of technique were tried out, and observation of progress, checked up by every known laboratory means, brought about a basic knowledge of this work which has gradually developed a standard that is now accepted as having a rational value in the treatment of many and varied diseases.

Diathermy may be used to advantage in practically every condition where inflammation exists, and on this account it might well be referred to as the anti-itis treatment. The main exception to this would be any condition wherein there is confined or walled-off pus, but even here it may be used when once drainage is established. If it is desired to heat the part treated uniformly the electrodes must be placed in exact apposition and should be of equal size. If we wish to concentrate the heat effect upon one place or another, the electrode placed on that part should be the smaller of the two. Strict attention should always be given to the individual reaction in considering the question of the time and current dosage.

In books and papers written upon the subject of diathermy or any general use of high frequency currents, it is frequently noted that reference is made to a particular current dosage followed as a part of the technique. Many times others who attempt the treatment of similar conditions by this prescribed technique will fail to get the desired results. This failure may be, and no doubt in many cases is, due to the variation in the quality and quantity of current delivered by different makes of apparatus. When diathermy is used as a means of treatment, it is well to bear in mind that the amount of current indicated by the meter is only a partial guide to the amount of heat generated in the tissues of the patient. Other factors being the resistance offered by the tissues to the passage of the current through them, and the voltage which we obtain from the apparatus available to our use, when diathermy is used, so that when we speak or write of a given treatment in which we make use of a certain number of milliamperes of current we are expressing an indefinite and variable dosage.

If we are students of our work, our experience and observation will tell us the technique we should follow and this must depend upon the equipment available to our use and our knowledge of the quality and quantity of current which it can be made to produce, so that in all treatment by diathermy the exercise of individual judgment is all important and we cannot depend entirely upon following any rule. This must be our procedure until such time as physicians are able to get and use apparatus and equipment with a common standard of current quality, quantity, control and measurement.

Laboratory investigation carried on by the writer while in charge of the department of physiotherapy in the Walter Reed General Army Hospital, Washington, D. C., during the last war, in which animals were used for experimental purposes, thermometers being sunken at various depths in their organs and tissues, showed conclusively that definite and decided rise in temperature occurred when diathermy was passed through them.

Other workers in this field, as well as some of our eminent physicists, have experimented along other lines in an attempt to prove the definite heat effects obtained from high frequency currents used in the body, and some day probably we shall have instruments which will record accurately the exact heat reaction taking place in the tissues when high frequency currents are used both for reconstructive and destructive effects.

It is quite generally agreed that the effect of diathermy on the human body is due to the production of heat; whether other effects are produced is not yet a matter of positive knowledge. We all know that heat applied to living tissues results in hyperemia. The use of diathermy causes a rapid increase in arterial and capillary circulation, dilating these vessels and quickly producing in the field a markedly increased phago-cytosis.

Professor Bier in a report on his studies of hyperemia by the ordinary methods of heat penetration has shown that the production of analgesia and absorption, also bactericidal and nutritive effects are brought about when hyperemia is induced in the tissues. The heat or

hyperemia produced by the method of diathermy is of particular advantage because it is transmitted throughout the entire area between the electrodes used with a positive directness not possible by any other known method of heat production.

Diathermy as a means for the treatment of pathological conditions is growing in popularity, and new indications for its use are being developed constantly. Some of the pathological conditions in which the use of diathermy is indicated and wherein it has a definite action are as follows:—arthritis, neuritis, sciatica, epididymitis, prostatitis, various circulatory disorders, coccygodynia, functional dysmenorrhea, fibrositis, bursitis, arteritis-obliterans, conditions accompanied by ischaemia, lumbago, congestion of the liver, nephritis, various neuralgias, pleurisy, post-operative adhesions, synovitis, sprains and strains of muscles and ligaments, and as an aid to repair in the treatment of fractures.

In addition, many times diathermy serves its purpose as a useful adjunct to the use of drugs, serums, or other means of combatting the invasion of disease processes. One marked demonstration of this latter value of diathermy is its great usefulness in the treatment of pneumonia, as presented to the medical profession in a paper on this subject by Dr. Byron S. Price, of New York City, in 1909. Since its general use in this disease by workers in the field of physiotherapy the rate of mortality has been reduced more than fifty per-cent.

In a series of seventeen cases of pneumonia referred to the writer recently for treatment by diathermy, most of which were treated at the Gale Hospital in Haverhill, but one death occurred, this being a patient about eighty years of age in whom the disease, having subsided after passing through its changes in one lung, began again in the other.

In treating pneumonia it is of the utmost importance for us to individualize the treatment, particularly in reference to dosage, being careful to observe the changes in temperature, pulse and respiration; also such nerve reactions as depression or extreme restlessness which, if unfavorable, would call for at least a temporary cessation of our treatment; and judgment must then be exercised as to the proper time to renew the application.

Anyone who recognizes the fact that heat has any value in the treatment of pathological conditions must admit that diathermy is of equal and even greater value than any other known method of heat production for purposes of treatment, since it is now an established fact that diathermy means the penetration of heat at any desired temperature to any desired depth and under perfect control when produced or generated by a good standard high frequency apparatus.

Diathermy is not in any sense a cure-all in the treatment of disease, and it is only one element of value in the great field of electrical measures for treatment. Many times if we meet with failure and feel that we have exhausted our resources, diathermy having been employed, we shall still attain surprisingly successful results if we turn to the use of some other one of our electrical measures such as the galvanic, static, or sinusoidal currents, or actinic radiation; and there are many instances in which a combined attack, using two or more of these agents, will bring about the desired results.

It thus becomes apparent that the greatest success in the treatment of pathological conditions by electrical means must come through a thorough understanding and employment of all electrical agents of known value, as no one of them will be found applicable to any great number of the many diseased conditions encountered in our practice.

When the medical profession appreciates properly the importance and value of coördinating methods and coöperating practically with those who are specializing in this field of our work, then only will the standard of electrical measures of treatment be elevated to its position of well deserved recognition as a most valuable means of preventing, controlling and overcoming the progress of disease.

BIOPHYSICS OF ULTRAVIOLET LIGHT*

BY W. T BOVIE

Rays exert their therapeutic influence either through heating or chemical effects. Whether the effect is that of heating or of chemical change, Grotthus Law, the first law of photochemistry, holds strictly.

Grotthus Law, stated so as to include both the heating and chemical effects of radiation, is: Only the radiant energy which is absorbed can be effective in bringing about physical or chemical change. This leads us to consider the extent to which tissues absorb the particular kind of radiation we employ. That is to say, we must know the *absorption index* of the tissues.

The absorption index is a measure of the fraction of an incident beam which is absorbed by a given thickness of tissue.

In a homogeneous absorbing medium, a beam of radiant energy of uniform wave length is absorbed in accordance with Lambert's law. This law states that the fraction of a beam of radiant

*Read at the annual meeting in Springfield, Mass.

energy which is absorbed by a given thickness of absorbing medium is independent of the intensity of the incident beam.

The law becomes more useful when given a mathematical statement. In the shorthand of mathematics

$$i = Ie^{-\mu d}$$

In this expression i is the fraction of the incident beam, I, transmitted through a thickness d of an absorbing medium. μ is the absorption index. This mathematical formula will serve as a formal definition of the absorption index.

Now, for a homogeneous medium the absorption index varies with the wave length of the radiant energy, and if we write down for any particular absorption medium the values of μ for the different wave lengths, we have a numerical expression of the so-called *absorption spectrum* of the absorbing medium.

As the numerical value of the absorption index increases, the amount of absorption increases, and as the amount of absorption increases, the penetration of the rays decreases, and therefore the depth to which the rays will exert a direct influence decreases. (See Fig. 1.)

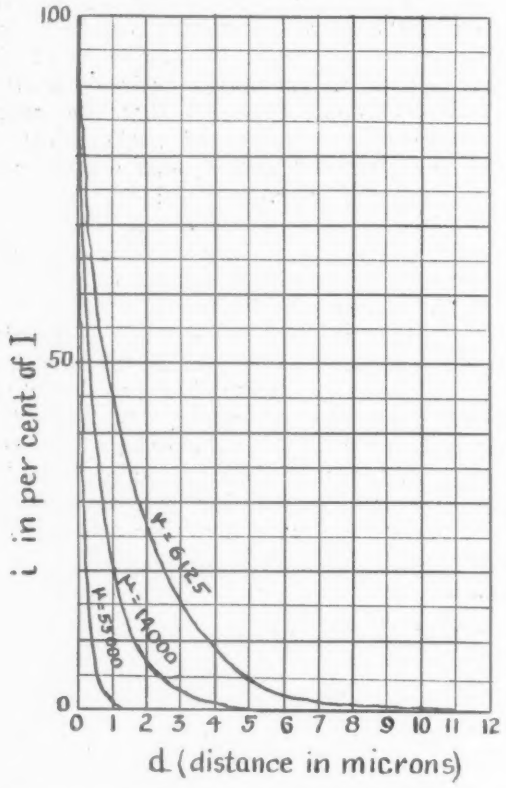

FIG. 1. A graphical representation of the variation of the intensity i in per cent of the incident intensity I_0 measured on the axis of ordinates (light lost by reflection neglected) with the variation of the thickness d, measured on the axis of abscissae of the absorbing medium measured in microns. The relation between i and d is given by Lambert's absorption law

$$i = I_0 e^{-\mu d}$$

in which e is the base of the natural system of logarithms and μ is the absorption index and i and I_0 represent the quantities indicated above.

The three curves are for different values of the absorption index μ. Reading from right to left, the values taken for μ are 6125, 14,000, and 55,000. For further information regarding these values, see a paper by W. T Bovie, "An Approximation of the Value of the Absorption Index of Fluorite Rays in Protoplasm" (Jour. Med. Research, Vol. 39, p. 239, 1919).

It is customary to represent absorption spectra by graphs, plotting the wave length along the horizontal line, and the absorption index along the vertical line.

No experiments have been conducted to determine the absorption index of protoplasm throughout the whole extent of the electro-magnetic spectrum. It is possible, however, to give an approximate representation of the absorption index of unpigmented protoplasm, based upon the study of substances more or less related to the constituents of simple unpigmented protoplasm. The general characteristics of the absorption spectrum for protoplasm are shown in the accompanying figure. (Fig. 2.)

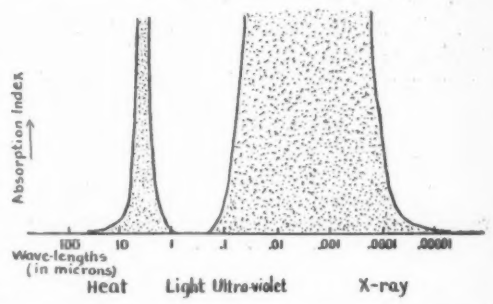

FIG. 2. Regions in the spectrum where protoplasm strongly absorbs.

You will observe that there are two absorption bands in protoplasm, one in the heat region, and one lying between the ultra-violet and X-ray regions of the spectrum.

The position for the absorption band in the heat region of the spectrum, I have taken from the absorption spectra of water, and of gelatine as determined by Coblentz.

For the ultra-violet region of the spectrum, I have used the data compiled by Henri on the absorption of egg white, and for the X-ray region, I have used the absorption index of water, paper and other substances having low atomic weights.

A consideration of the absorption spectrum of protoplasm, as thus approximated, reveals some very important facts concerning the penetration of rays into tissues. For example, if we consider the heat region of the spectrum, and especially that part of the heat region lying nearest the visible region, it will be observed that as we move in the direction of the visible, the absorption index decreases, and therefore the penetration of the rays increases.

If we borrow the terminology of the X-ray therapists, we may speak of soft and hard heat rays. The soft heat rays are those for which the tissues have a high absorption index, and are therefore those which are absorbed near the surface, and for the particular part of the heat region of the spectrum under discussion, the soft heat rays have a longer wave length than the hard heat rays. In this region of the heat spectrum, therefore, the relation between hard and soft rays and the respective wave lengths is similar to that found in the X-ray region of the spectrum, but it will be observed that in the heat region of the spectrum lying farther from the visible, that is the extreme infra-red region of the spectrum, the relation between the wave length and penetration of the radiation is just the reverse of that found in the X-ray region.

If, therefore, we wish to use radiant heat as a therapeutic agent, we will obtain greater penetration if we use those radiations lying as close as possible to the visible part of the spectrum; and if we could obtain a sufficient amount of energy, we would obtain a greater penetration if we actually used the visible rays.

The chief difficulty in using visible light as a source of heat is to obtain sufficient intensity of the deeply penetrating rays without at the same time having an excess of the long wave length or dark heat rays, which are absorbed at the surface and therefore produce excessive surface burning.

This is not an unsolvable problem, however, for it would not be difficult to filter out the soft heat rays and to concentrate the penetrating radiations by means of lenses or mirrors. That it has not been solved as yet is simply because the clinician has not demanded it.

To make the matter clearer: If one exposes the skin to the radiant heat from a hot stove, even though the intensity of the radiation exceeds the tolerance of the skin, the body as a whole is not appreciably warmed, but an exposure of the skin to the radiant heat from the sun will warm the body to the bone without burning the skin. The reason for this is to be found in the fact that the heat rays from the stove are "soft," while the radiations from the sun contain "hard" heat rays. The solar rays penetrate deeply into the body and warm the blood stream, while the radiations from the stove are absorbed too near the surface of the skin to warm the blood. (See Sonne, who has investigated this penetration of heat within the body in a quantitative way. *Hospitalstidende*, 63:321-34. 1920.)

If we examine again Figure 2, we will see that in the ultra-violet region of the spectrum, the conditions are just reversed:—as the wave length decreases, the penetration decreases.

"Soft" ultra-violet rays have a longer wave length than "hard" ultra-violet rays.

In the practice of radio therapy, radiations are frequently used for their cauterizing effect. In these cases, the destroyed tissues or the photochemical products remain at the site of absorption, and the energy absorbed by these products is lost so far as any therapeutic effect is concerned. In such cases two important considerations enter into the dosage.

Without bothering you with the derivation of the formulae, I have recently shown in a paper to be published in the next issue of *The Journal for Cancer Research*, that the effect

$$E = \text{Log}_e \frac{\mu}{e} It$$

in which E is the effect, I is the intensity, t is the duration of the exposure, and the fraction $\frac{\mu}{e}$ is the *susceptibility of the tissues.*

This equation shows one important relation very clearly:—the effect is proportional to the logarithm of the exposure. That is to say, if we wish the effect to increase by even steps, the exposures must increase geometrically.

The term $\frac{\mu}{e}$, that is, the susceptibiiity of the tissues, is of very great importance, but it has not yet actually been determined for any therapeutic procedure.

In this fraction, μ is the absorption index of the tissues, and e is the exposure required to produce a single unit of change.

I will merely state then that the term $\frac{\mu}{e}$, that is, the susceptibility of the tissues, is a statistical quantity, and its numerical value varies from individual to individual and indeed from cell to cell in the same tissue, and like all other biological data can be given only a statistical value. The variability of this term measures the range of "idiosyncrasies" of the patients.

I have gone through a considerable amount of literature, and have obtained a very large number of experimental data which attest to the validity of the equation.

I have found that this law applies to the destruction of red cells by radium rays, to the killing of bacteria by ultra-violet light, to the destruction of tumor tissue by X-rays, and to the killing of insects and of the seeds of plants by various kinds of radiations. In fact, it is a general expression which must form the basis of all rational dosage of radiations.

There are effects of radiations for which the above considerations do not hold—namely, those effects that result from the production of photochemical substances which, after being transported away from the place where they are

formed, bring about changes in the functioning of the organisms. It is obvious that in such cases the logarithmic relation of exposure to effect does not hold. The so-called systemic effects of radiation belong to this class.

In this paper we shall use the term "systemic effects," to include not only those effects which are catalogued as therapeutic results of radiation, but also the effects of photochemical products on the normal growth and differentiation of the organism. It seems to me, these photochemical products are always formed as decomposition products of the protoplasm. The best known of these photosyntheses, of course, is the photosynthesis of carbohydrates which occurs in green plants. The importance of this photosynthesis in the economy of nature is expressed by the statement that all of the food of all plants and animals that live or have lived on the face of the earth is ultimately due to this synthesis.

We might, therefore, include all branches of biology under a discussion of the systemic effects of carbohydrate photosynthesis.

There is another photosynthesis which is equally important in the growth and development of plants and animals. This can be easily demonstrated in plants by depriving the developing organism of light, for when light alone is restricted, practically all of the higher plants and most of the fungi are unable to complete their development and form fruit. Our experimental method has made the light the limiting factor in their development.

If the amount of illumination is still farther restricted, green plants take on a characteristic appearance that is known as etiolation. Nearly 200 years ago Bonnet experimented with peas, beans, and branches of vine, and observed that when they were deprived of light, elongated internodes and small yellow leaves were produced; and he observed that the wood of etiolated stems did not "harden" and cuttings from etiolated stems could not propagate the plant. Since the time of Bonnet many investigators have studied the influence of light on the growth and development of plants.

The great plant physiologist Sachs, after years of investigation, came to the conclusion that some specific formative material was necessary for the construction of the various organs, particularly the flowers. Flowers could be developed only when the buds were laid down and provided with "anthogenic" material, which was the product of leaves in sunlight and might not be replaced by building material from storage organs. He believed that he had demonstrated that the ultra violet rays of the spectrum were necessary for the formation of the special anthogenic, or flower-forming substances, and that these rays exerted an important influence upon the growth and development of plants.

More recently, MacDougall says that "doubtless the most important and basic fact common to all species, not including degenerate, chlorophylless forms, is that the tissues of etiolated organs do not show the same degree of morphological differentiation as may be found in corresponding members of the same age exposed to illumination. The tissues of stems, leaves, and floral organs undergo only limited departures from the embryonic or bud condition when grown in darkness, and the varying amounts of differentiation in the separate instances may be infallibly traced to the action of light upon the plant during the period of definitive formation of the organs in question."

These facts offer a splendid illustration that while growth and differentiation are not wholly independent, they are easily separable processes, if the action of the factors inducing differentiation is prevented. This is patent to those actively engaged in research on the biological aspect of neoplastic growths.

The action of light upon an organism in producing morphological differentiations is not due to any direct action which the rays might exert upon any particular tissue, or to the action of light upon any part of the organ concerned. Indeed, the effect may be communicated to organs not actually formed at the time the stimulating rays were received.

Thus for example, if a plumule in the bursting seed is merely exposed to illumination, or if a bulb or tuber has been exposed to the action of light, even during the previous vegetative season, though they be subsequently raised in darkness, the differentiation of tissues will be carried further than in plants that were wholly laid down and developed in darkness.

We are all familiar with the embryonic character of the potato sprout which has grown in a dark cellar. The leaves are small, the pigment chlorophyl has not differentiated so the sprouts are white. The mechanical tissues have not differentiated, and so the sprout breaks readily.

Plants of the Deadly Nightshade family to which the potato belongs contain alkaloids. Solanin, the alkaloid of the potato, is only developed in the tuber of the potato when it has turned green from exposure to the light. The housewife rejects "sun burned" potatoes.

The effect of light deficiency upon the differentiation of tissues and plants is well illustrated by bleached celery. Bleached celery contains an abundance of sugar from which the plant would normally form its mechanical tissues by condensing the sugar into cellulose, but the differentiation does not occur, and the celery, though sweet, is tender and without stringy tissue. Now, the family Umbelliferae, to which the celery belongs, is characterized by aromatic oils. It is this oil of the celery which flavors our soups. The cook would not attempt to flavor soup with blanched celery. She uses the green

leaves at the top. Light is necessary for the differentiation of the aromatic oil.

We must not look upon differentiation as merely a change in the architecture. The reference to the solanin of the potato and the aromatic oil of the celery emphasizes the fact that we must include in our concept of differentiation not only the formation of tissues, but also of chemical entities which play an important role in the functioning of the organism.

I feel justified in devoting so much time to the discussion of the effects of light deficiency upon the development of plants because the botanists have been actively investigating this particular subject for nearly two hundred years, and I believe that a great many of their findings are as applicable to the economies of the animal as of the plant.

The animal relation of the problem, too, has a long history, though the study through con-

FIG. 3. The small chicken received only sunlight which had passed through the glass. The large chicken had been exposed twenty minutes a day to the light of a quartz mercury lamp. Otherwise it was confined to the glass greenhouse.

trolled experimentation has been comparatively recent. The use of sun baths as a therapeutic agent antedates recorded history, and Walter Harris in "A Treatise of the Acute Diseases of Infants: to which are added, medical observations on several grievous diseases," translated from Latin by John Martyn, London, 1742, in a chapter dealing with tetany in children (page 50), has this interesting statement:—"But yet if among many testaceous Bodies of almost the same Nature, I would prefer one before the rest, I should commend common Oister-Shells, such as are found on the Sea-Shoar, and have endured a long Insolation, being ripened into Use by the benign Rays and vivific Heat of the Sun, and thereby far better prepared than by a Chymical Fire, and changed into a bluish or yellowish Colour."

It is impossible to draw my illustrations from the field of animal physiology because the animal experimentation has not been done. I believe that the knowledge gained by the botanist will be a valuable guide to animal experimentation. I have found it so in my own laboratory.

For example, Hess, Steenboch, and Bovie (Fig. 3) have each shown that chickens are unable to grow and develop when deprived of ultra violet light which lies in the extreme ultra violet part of the solar spectrum, and the relation of light to the rachitic syndrome is well known to all of you. The faulty calcium metabolism, the hypersensitive nerves, the rachitic bone are all comparable to the malformations of etiolated plants.

In the case of animals, as in plants, the stimulating action of the light is not confined to those tissues within which the light is absorbed, so that we must believe that a photosynthesis occurs in animals, and that the photochemical product thus formed is transported to the place where it manifests its effects.

There is, however, one important distinction between the animal and the plant. While it appears to be necessary for the definitive materials to be formed within the tissues of the plants, in animals, to a limited degree at least, these definitive materials may be formed in the food, for it has been found that by exposing certain foods to ultra violet light, these foods may be made anti-rachitic.

As I have remarked above, this differentiation is not confined to morphological structures, but includes chemical entities as well, and from our experiences with the light treatment of certain diseases, as tuberculosis, it appears that an exposure to light causes the formation in the body of certain substances which enable the patient to resist the inroad of bacterial infections.

It has been said that the history of rickets and tetany begins with the extensive use of window glass, and it appears that the human race has been penalized by the invention. The warmth of our houses, our enclosed vehicles, our playrooms, and sun parlors, all contribute to our comfort, but our developing children pay the price. Exposure in the open air is a primary necessity for the growing child.

It is a matter of common observation that the well tanned child is a happy child, and that the child deprived of a proper exposure to light is petulant and nervously irritable. Such a child is hard to handle. Is it not reasonable to believe that this condition is due to a burden imposed upon the health of the child? Can we expect that a child laboring under such "nervous insufficiency" will later be able to cope

with its environment? The child's mental body can be deformed from a lack of proper illumination as well as its physical body.

At any rate, whenever I have made this remark before gatherings of medical men, some physician in the discussion has contributed the statement that, as a caretaker of the insane, he has observed that the patients are more easily handled when they have received a proper exposure to open sunlight.

CLINICAL APPLICATION OF ULTRA VIOLET LIGHT*†

BY EDWIN T. WYMAN, M.D.

THE value of sunlight as a healing agent has been realized by mankind from the very earliest time of which we have any record. The sun was worshiped in ancient civilization, in most cases, because of its supposed power of being able to drive away the demons of sickness and to expel disease. Herodotus, 431 B. C., mentions the sun-bath and recommends it for restoring muscular tone.

Hippocrates, the father of modern medicine, was born in 460, B. C., and practiced in the island of Cos, in the Greek archipelago. Here a great health temple was erected to Aesculapius, god of the sun, medicine and music. This temple, known as the Asklepieion, was built a little inland from the sea on the slope of a range of mountains which faced south and was some three hundred feet above sea level. Its situation gave it a maximum of sunlight and pure fresh air. Excavations at this temple have shown a large gallery facing south and adjoining the hospital; there is every reason to believe that this was used for sun-baths. During the Roman era, the sun was made the central object of adoration, and a solarium, situated, as a rule, on the roof of the house, was considered a part of almost every Roman home.

Heliotherapy, while thus well known as a therapeutic measure in olden times, became a lost art for many centuries, practically until the nineteenth century.

Rollier of Lysin and Bernhard of Samaden deserve the credit of re-establishing heliotherapy as a therapeutic measure of value. We are especially indebted to Rollier, for he, after fifteen years' experience and careful observations, was the first to lay down a well defined scheme of carrying out heliotherapy. The essential point of his routine treatment is to gradually increase the exposure of small areas of the body to the sun's rays until the entire body is exposed. Thereafter, the patient receives a daily sun-bath of from three to five hours.

While Rollier obtained his best results in surgical tuberculosis, he recommended its use in all forms of tuberculosis, wounds healing poorly, skin lesions, such as ulcers, intertrigo and some cases of eczema, primary and secondary anemias of children, infantilism and debility of unknown origin, and rickets. In pulmonary tuberculosis he employed special care and selected only patients with little or no febrile reaction.

In New England it is impracticable to expose an infant to the direct rays of the sun and it is oftentimes inadvisable to expose older children, except during the warm summer months, on account of the cold and consequent loss of body heat. This difficulty, however, may be overcome when a quartz window or a glass which is transparent to the ultra-violet rays is available at a reasonable price so that the baby can have its sunlight treatment in a warm room.

The ultra-violet rays in the sun's spectrum vary in intensity during the different seasons of the year, being highest during the summer months and lowest during the winter months.

It is believed that this seasonal variation is due to the absorption of the shorter wavelengths by the atmosphere. In New England during the winter months it is questionable whether or not there are sufficient ultra-violet rays in the sun's spectrum to be of much therapeutic value. At present during the winter months and on cloudy days in summer, it is necessary, in treating infants, to use a substitute for sunlight. The mercury vapor quartz lamp at present surpasses all other sources in ultra-violet efficiency and is the best means of artificially producing rays similar to the short therapeutic rays in the sun's spectrum. The sun's spectrum ends abruptly at about 296 millimicrons; due to the absorption of all shorter wavelengths by ozone in the atmosphere. The mercury vapor quartz burner emits ultra-violet radiation, consisting of a continuous spectrum between 185 and 400 millimicrons, upon which is superimposed the mercury arc line spectrum, the principal lines of which are at 364, 313, 302, 280, 265, 240, 200 and 185 millimicrons. There are many other lines, but those mentioned above are the most intense. The two lines at 265 and 255 are especially strong. The line at 364 is the strongest line of the mercury ultra-violet spectrum. Experiments[1] with light filters in irradiating cholesterol solutions seem to show that rays of 302 millimicrons or less are necessary to confer antirachitic property.

We are now using Alpine Sun Burners in the Out-Patient Department and Medical Wards of the Children's Hospital when individual treatments are given. In the Infants' Hospital, we are using a room with four Burdick lamps suspended near the ceiling, arranged to give as

*From the Department of Pediatrics of the Harvard Medical School and the Infants' and Children's Hospitals.

†Read at the annual meeting in Springfield, Mass.

even a distribution of light as possible over the cribs. This permits us to treat a number of patients at the same time. The room contains ten cribs. The individual treatments are given with the lamp at a uniform distance of 20 inches from the surface of the body. The entire surface of the baby with the exception of the head is exposed. The head is protected by a sheet draped loosely over the head of the crib, or, when a table is used, the sheet is draped over a frame-work on the treatment table, coming down over the baby's neck. The front and back are given the same exposure. The patients are divided, because of the variation in skin tolerance, according to their complexions, —light, medium, dark and black. When individual treatments are given with the Alpine Sun Burner, the light complexioned patients are started at two minutes exposure, front and back, and the time of exposure increased two minutes, front and back, each treatment, until the total exposure of twenty minutes, front and back, is given. The medium complexioned patients are started at three minutes exposure, front and back, and increased three minutes, front and back, until the total exposure of twenty-five minutes, front and back, is given. The dark complexioned patients are started at four minutes, front and back, and increased four minutes, front and back, until a total of thirty minutes, front and back, is used. The black or negro babies are started at five minutes, front and back, and increased five minutes, front and back. until a total of thirty-five minutes, front and back, is given.

In the light room of the Infants' Hospital. equipped with four Burdick lamps suspended from the ceiling, having a vertical tube distance (from the patient to the burner) of 7 feet 6 inches, the same method of exposure is used as with the individual treatments, except that the total exposure of the light complexioned patients is increased to thirty minutes. front and back, the medium complexioned babies to a total of forty minutes, the dark complexioned patients increased to fifty minutes and the black or negro patients' exposure is increased to a total of sixty minutes, front and back. The ward patients are given daily treatments while the patients coming in to the Out-Patient Department are given treatments three times a week. This method of treatment is used in all types of cases. The time of exposure has to be shortened occasionally on account of a very delicate skin. The time given above for individual treatments with the Alpine Sun Burner is longer than should be used when new burners are employed as the efficiency of our burners has diminished with length of service.

SUN BATHS

When direct sun light is used, we use the following scheme of exposure:

Infants: The sun-bath can be given in a room with the sunlight coming through an open window, on a veranda or sun-porch, or in the shelter of a garden or yard. If given in the open the infant should be protected from the wind by a cloth screen on three sides. A sheet draped on three sides of the crib will do, although it is better to have the shelter four or five feet high. On cool days the hands and feet should be kept warm by means of mittens and socks, and a hot water bottle or an electric pad can be used to maintain the body heat. By means of an open window or door the bath can be given in a warm room, free from drafts. In starting the treatments the infant should wear a diaper, band and shirt. The head and nape of the neck should be protected from the direct rays of the sun by a sun-shade, cotton hat, or a sheet draped over the head of the crib. During July and August the bath should be given between 8 and 10 A. M., or between 2 and 4 P. M. In June and September it should be given in the middle of the day. At the start the baths may be given two or three times a day and, as the length of exposure increases, the number of baths are gradually decreased to one or two a day, depending on the complexion of the patient and the intensity of sun light.

SCHEME OF EXPOSURE

The legs and lower thighs are exposed to the direct sun's rays for five minutes, front and back. The exposure is increased five minutes, front and back, each day until on the third day the legs and lower thighs are exposed for fifteen minutes, front and back. On the fourth day the diaper is removed after the legs and thighs have been exposed for fifteen minutes and a total exposure of twenty minutes is given to the front; then the diaper is replaced and the exposure is repeated to the back. The exposure is increased five minutes each succeeding day until on the sixth day a total exposure of thirty minutes is given to the front and the back. On the seventh day the diaper is removed after the legs and thighs have been exposed for fifteen minutes; then, after a total exposure of thirty minutes, the band and shirt are removed and the exposure continued for five minutes longer until a total exposure of thirty-five minutes is given to the front. The diaper, band and shirt are replaced and the exposure repeated to the back. On the succeeding days this same scheme is followed, increasing the total exposure five minutes each day until on the twelfth day a total exposure of sixty minutes is given to the front and the back. On the following days the diaper, band and shirt are removed five minutes earlier in the exposure each succeeding day so that on the fifteenth day the diaper is removed at the beginning of the bath and the shirt and band are removed after fifteen minutes exposure. On the eighteenth day the diaper, band

and shirt are removed at the beginning of the bath and a total exposure of sixty minutes is given to the front and sixty minutes to the back. After the eighteenth day general exposures of one hour to the front and one hour to the back are given.

Children: The same scheme is used with children. First the legs and thighs are exposed, then the abdomen from the ribs to the hips, and last the chest.

This scheme shows the usual progression in normal cases; it does not represent a hard and fast rule and can be varied depending on the general condition of the patient, the tolerance to sunlight, temperature and wind, height of the sun and clearness of the atmosphere. It is better for patients whose skin burns very readily to take shorter treatments, three or four a day, to more gradually accustom the body to the sun. Many patients with dark skins can withstand twice the exposure given in the table. The whole object of the scheme is to get the patient well tanned without sunburn.

RICKETS

Rickets occurs universally in northern civilized countries, such as Europe and North America, where there is lack of sunlight during the winter months. The seasonal variation in the recurrence of rickets offers striking evidence of the part sunlight plays in the prevention of the condition. Rickets flourishes generally under poor hygienic surroundings, and especially under conditions where direct exposure to the rays of the sun is infrequent or entirely absent. Rickets can be cured both clinically and in experimental animals with certainty by the administration of cod liver oil. It can also be cured with certainty by the action of ultra-violet light. Palm[2], in 1890, recognized the full importance of the lack of sunlight in the etiology of rickets and gave remarkable recommendations for the eradication of the disease by means of sunlight. Radzyinski[3] wrote, in 1912, "it is the sun that plays the principal role in etiology of rickets," and he gave the first proof of the favorable influence of light on metabolism by an experiment on puppies. In June, 1919, Huldschinsky[4] reported that the ultra-violet ray therapy exerted a curative action in human rickets. He treated four children, who had advanced rickets, with the mercury vapor quartz lamp and found that at the end of four weeks it was possible to demonstrate by X-ray the deposit of lime salts at the ends of the long bones of the extremities, and at the end of two months the healing was almost complete. The discovery of Huldschinsky of the curative action of light in human rickets has been corroborated by numerous other investigators. Hess and Weinstock have made the remarkable discovery that such oils as cottonseed and linseed, which do not protect animals from rickets, and green vegetables, which have little or no antirachitic properties, can be endowed with antirachitic potency by exposing them to the radiation from a mercury vapor quartz lamp.

The result of many studies[5] has led to the conclusion that the chemical substances which can be activated by ultra-violet rays are cholesterol in animal foods and phytosterol in vegetable foods. These substances are present in almost every vegetable and animal cell.

In 1923 a special clinic for the treatment of rickets with the mercury vapor quartz lamp was started in the Out-Patient Department of the Children's Hospital, Boston. This clinic has been carried on since that time, except during the summer months when the patients are given daily sun-baths at home in place of the Alpine lamp treatments. In this time, we have treated about two hundred cases of rickets (varying in severity) with universal success. We concluded after treating a number of rachitic patients with ultra-violet irradiation and a number of rachitic patients with both ultra-violet light and cod liver oil[6], that the combination of cod liver oil and ultra-violet light probably hastened the healing process more than either ultra-violet rays or cod liver oil alone. At present, we are treating the moderate and severe cases of rickets with both ultra-violet irradiation and cod liver oil. The mild cases are treated with cod liver oil alone, as it seems unnecessary to have the patient make extra trips to the hospital for light therapy. The length of time required to cure severe cases, as shown by roentgenograms and the serum calcium and phosphorus concentration, is from six to eight weeks. They are then discharged from the "light clinic" and cod liver oil is continued to prevent a recurrence of the disease.

SPASMOPHILIA

Spasmophilia is a nutritional disease characterized by convulsions, carpo-pedal spasms, laryngismus stridulus and an extreme irritability of the nervous system to mechanical and electrical stimulation. The blood chemistry shows a low serum calcium concentration. It has been made quite clear that all cases of infantile tetany have rickets, but all patients with rickets do not have tetany. To treat an established spasmophilia one must use measures that will increase the blood calcium rapidly and permanently. Ultra-violet therapy has been shown to exert a favorable influence in tetany. These rays not only influence the symptoms favorably but the symptomatic relief is paralleled by a return of the calcium concentration in the blood serum to normal. The treatment followed at the Children's Hospital is to give calcium chloride, ten to twenty grains three times a day, in addition to ultra-violet irradiations. The result has been uniformly good. If rickets is present to a marked degree, as is often the case,

the treatments are continued until the rachitic processes are healed. After the patient is discharged from the "light clinic," cod liver oil is continued to prevent the recurrence of rickets, and calcium chloride is continued for a time to prevent the recurrence of tetany. The time required to cure the average case is from ten days to two weeks.

TUBERCULOSIS

Gerstenberger and Wahl[7] and others found the ultra-violet ray of decided value in the treatment of peritoneal, glandular and osseous tuberculosis. They think that of the glandular forms the mesenteric was most rapidly improved; next the mediastinal, and last, the peripheral. Beneficial results were not obtained in pulmonary tuberculosis of the miliary type, although treatments were begun early. The patients we have treated for tuberculosis of the mediastinal glands and tuberculosis of the mesenteric glands have responded well to ultra-violet therapy. The treatments have seemed to improve their general condition, to relieve the symptoms, such as cough in the bronchial cases and abdominal pains in the mesenteric cases, and to favor early calcification of the glands. Our results in the cases of tuberculous peritonitis have been variable. It is not expected that ultra-violet therapy will cure all cases of tuberculous peritonitis. However, our cases show that it is a valuable therapeutic measure. We believe that it should be used unless there is marked febrile reaction. It is much more difficult, in treating tuberculosis and many other diseases with ultra-violet rays, to draw definite conclusions as to the benefits obtained from this form of therapy, because in rickets and tetany the blood chemistry and X-ray give confirmatory evidence of recovery. One has to depend almost entirely on clinical findings to note the progress of the case and it is often difficult to tell how much the disease has been influenced by the rest, fresh air, proper nourishment and general hygiene given as routine treatment in addition to the ultra-violet rays.

PSORIASIS

We have observed marked improvement in all the patients treated for psoriasis while they received treatment.

FURUNCULOSIS

Our results with furunculosis have been favorable, although in most cases the improvement was no more marked than when the ordinary treatment was used. Some persistent cases, which did not respond to vaccines and local treatment, cleared up rapidly, however, with ultra-violet therapy.

ECZEMA

We have not found this form of therapy useful in cases of eczema, although in some instances, with additional infection of the skin, the germicidal properties of the light helped to clear up the infection.

BRONCHIAL ASTHMA

We have used this form of therapy in a case of bronchial asthma in which the child has a sensitization to bacteria. After other forms of treatment had failed, ultra-violet irradiations had a most beneficial effect. The attacks have become less frequent and less severe and the patients were improved in all respects.

CONCLUSION

In conclusion it can be said that the quartz lamp can be used as a substitute for sunlight and has the advantage of being available regardless of sunshine and weather. It can be given in-doors so as not to subject the infant or child to the cold, and the doses can be more accurately gauged. There is, however, a very real danger of becoming too enthusiastic about ultra-violet therapy rays lest this form of treatment be looked upon by the physician and his patient as a quick and sure cure for all ailments. It can be said, however, that ultra-violet light therapy has a specific action in treating rickets and spasmophilia and is a valuable therapeutic agent in the treatment of tuberculosis of the mesenteric and bronchial glands and tuberculous peritonitis. Further investigations will be required in other fields before definite conclusions can be drawn.

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THE PRESENT STATUS OF RADIATION THERAPY IN CARCINOMA*

BY GEORGE W. HOLMES, M.D.

INTRODUCTION

THE intelligent treatment of the various forms of malignant disease by irradiation must depend not only upon a good understanding of the clinical course and pathology of the disease, but also upon a knowledge of the effect of radiation upon malignant tumors, normal tissue and the organism as a whole. It is also desirable that the radiologist be familiar with other forms of treatment and their effect when combined with irradiation.

In most clinics for the treatment of malig-

*Read at the annual meeting in Springfield, Mass.

nant disease it has been found that to obtain the best results it is necessary to employ a group of workers in special fields, rather than to rely upon any single form of therapy. It is probably necessary in the treatment of most cases to have the coöperation of two or more workers to obtain the best results. Frequent consultations are a necessity.

THE SELECTION OF CASES

Before instituting any form of treatment, a definite diagnosis should be made; if malignant disease is present we should know its type, degree of differentiation and extent. Any one of these factors may determine the kind and method of treatment. The various therapeutic measures should be discussed and a definite plan of treatment decided upon. Too often a patient is referred for irradiation following some other form of treatment which in itself has made a satisfactory result impossible. The reverse is equally true. Where a cure by any form of treatment is obviously improbable, no attempt at cure should be made, especially if the suffering of the patient is likely to be increased. In these cases our effort should be directed to the control of the distressing symptoms and prolongation of life.

While no great advance has been made in radiation therapy during the past five years, considerable data has accumulated, and some theories have been confirmed and others discarded. Ewing[1] has recently published an extensive review of our knowledge of the effect of radiation on tissues and its application to dosage and treatment. In discussing this subject, I have drawn freely from his work.

CURABLE AND INCURABLE CASES

In general, cases may be divided into two main groups: first, those in which a cure can be expected; second, those in which the type of the disease or its extent makes a cure by any method improbable.

In group one there are relatively few cases which can justifiably be treated by radiation alone. Most of the cases in this group are curable by surgical means which, until we know more about the effects of radiation therapy, offers a surer and more satisfactory method of treatment. Where radiation treatment is undertaken, complete destruction of the diseased tissue must be obtained. Present data seems to indicate that this is not likely to be accomplished unless the lesion is superficial, or so located that radium can be brought directly in contact with it. The most favorable results are obtained in cancer of the uterine cervix, and in cancer of the mouth and skin. Since it seems likely that short wave rays have a more selective action than longer ones, it is desirable to use this type of radiation where complete destruction of malignant cells is attempted. For this reason curable cases are treated by heavily filtered rays, but in some cases this is not practical, as when the lesion is deep seated or resistant. In these cases it may be necessary to use interstitial radiation. This may be accomplished by implanting bare glass seeds containing radium emanation directly into the mass, or by the insertion of needles

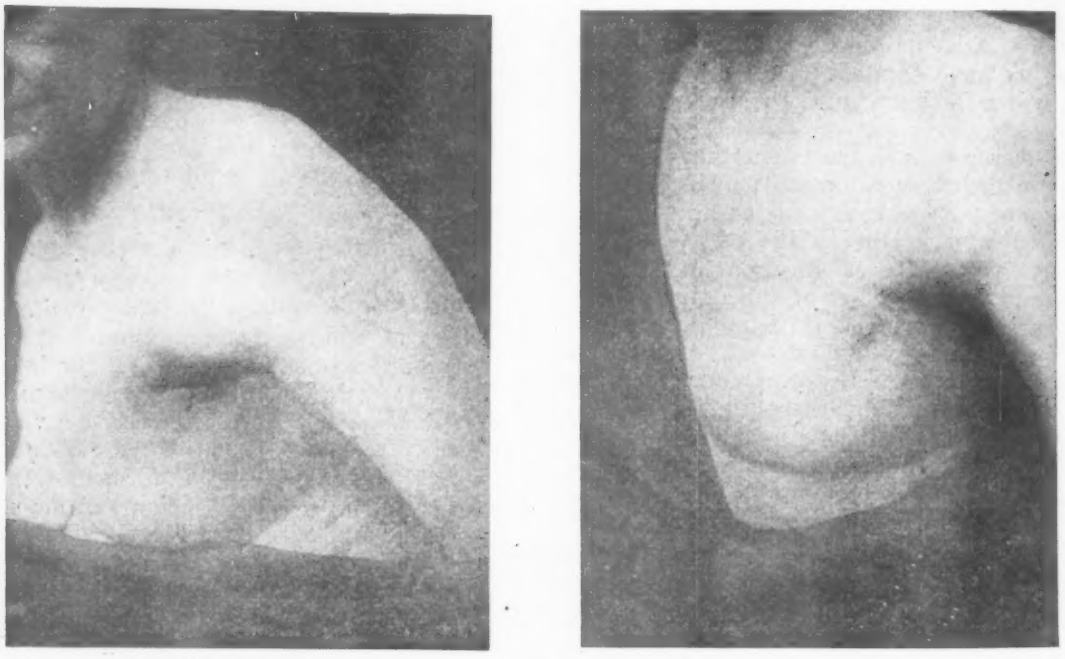

PLATE 1. Case number 45986. Inoperable carcinoma of the breast, with ulceration and enlarged glands in the axilla and above the clavicle. After treatment with short wave x-ray the local lesion disappeared.

containing radium salt or emanation. Better results are obtained by the latter method, as the needles act as a filter removing caustic beta rays, and a more complete destruction of the diseased tissue is obtained with less discomfort to the patient.

By far the greater number of cases receiving radium treatment are in group two; those cases in which a cure by any method is improbable. This group may be subdivided into primary lesions and post-operative recurrences. In both instances the treatment is, of necessity, palliative and should be quite different in kind and quantity from that used in group one, where a cure is expected. In group two we must rely more upon aiding the normal resistance of the patient than upon destruction of the diseased tissue. For this reason it is rarely advisable to use prolonged or extremely heavy dosage. Such treatment, with its resulting radiation sickness, not only produces exhaustion, but it also reduces rapidly the number of circulating lymphocytes. Murphy[2] and others have showed that there is a direct relation between the number of lymphocytes present and the ability of the organism to combat the advance of a malignant growth. A rapidly falling or low white count is an indication of over dosage. There is considerable evidence in favor of the small, so-called stimulating dose in the treatment of these cases. Such dosage, if not continued over too long a time, has produced excellent results. The theory that malignant tumors can be stimulated by repeated small doses has no scientific basis. It seems more probable that heavy radiation, if it fails to destroy all the malignant tissue, so injures the surrounding normal tissues that it offers very little resistance to the rapid advance of the remaining cancer cells.

If the general appearance of the patient is good and the blood picture is normal, large doses may be given to destroy local masses which are causing distressing symptoms. It should be remembered that with the exception of lymphoblastoma and a few other rare tumors, the dose necessary to produce a destructive effect must considerably exceed that which produces injury to the normal skin.

Patients with advanced malignancy showing anemia, rapid loss of weight, and weakness are probably done more harm than good by any form of irradiation. This is especially true if the massive dose is used. An exception to this general rule is seen in some cases of lymphoblastoma. Occasionally a patient, seemingly in the last stages of lymphoblastoma, will improve in a remarkable manner under carefully applied small doses of short rays. This is more likely to happen if the patient has had no previous radiation treatment. Nodular masses and surface ulcers in advanced cases of cancer which do not show cachexia, may be successfully treated and given considerable symptomatic relief. No attempt should be made to control the general course of the disease in these cases. The best results are obtained with a few, rather strong, superficial treatments. Prolonged exposures with very penetrating rays are almost certain to exhaust the already debilitated patient, and hasten the general progress of the disease, while the local effect is no better with one method than with another.

In some patients with extensive metastasis to bone, pain is severe and difficult to control. Small doses of rather short wave X-ray directed to the involved area may give temporary relief and are justifiable. If a prompt response is not obtained the treatment should be stopped.

PRE AND POST-OPERATIVE RADIATION

The rationale of this procedure is as follows: first, that the tumor cells are severely damaged by irradiation, and should any be dislodged during the operation, there is less chance of their living to produce metastasis; secondly, that lymph channels are destroyed, thus limiting the spread of the disease. During recent years there has accumulated considerable experimental data confirming the soundness of the first of these theories. Murphy and his co-workers have shown that tumor grafts do not take with such regularity in recently irradiated as in unirradiated tissues. It has also been shown that sections from irradiated tumors are less productive of growth. The second theory, on the other hand, has lost ground. It has been shown that the lymphatic channels remain open after irradiation, and that the normal lymph gland is very resistant

The objections to pre-operative irradiation are: first, it delays the operation; second, roentgen sickness may increase the operative risk; third, infection of the wound or sloughing of the skin flaps is more likely to occur.

If we do not attempt to produce fibrosis, which is probably not an important factor in preventing recurrences, there need be no great interval between the irradiation and the operation. Radiation sickness can be avoided by giving the treatment in divided exposures, or by waiting two or three days after the irradiation before operating. Injury to normal tissue cannot be wholly avoided, but if the surgeon will consider this factor at the time of operation no untoward results are likely to occur. I believe pre-operative irradiation should be more generally used, especially in those cases which are in the border line group, or in which the disease is of an unusually malignant type.

Post-operative irradiation is rather generally used, although there is little evidence that it prevents recurrences or prolongs life. A group of treated and untreated cases of cancer of the breast studied by Greenough showed no differ-

ence in end results. If radiation does not produce destruction of cancer cells, obliteration of lymph channels, or extensive fibrosis, except when given in doses sufficiently large to produce permanent injury to normal tissues, it is hardly to be recommended in cases where there is a good chance that the disease has already been cured by operation. On the other hand, those cases where complete surgical removal is improbable are better treated by irradiation alone.

A method of treatment recommended by Beclere may be of some value as a post-operative measure. This method is based on experimental data which seems to show that the cumulative effect is greater in dormant than in active cells.

PLATE 2-A. Carcinoma of the breast. Case number 111001. Post-operative with recurrent nodules in the skin and beginning ulceration. Treated locally with short wave x-ray.

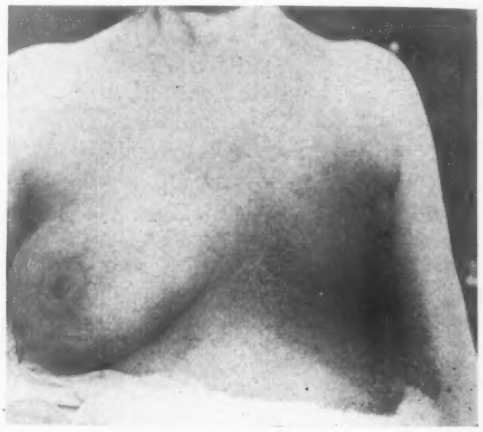

PLATE 2-B. Shows patient after x-ray treatment. Complete local relief.

Beclere assumes that cancer cells, from which nutrition is cut off at the time of operation may lie dormant in the tissues for a considerable period and that the cumulative effect of repeated small doses given during this dormant period will be sufficient to cause the death of the cells should they eventually start to grow.

The present status of post-operative irradiation is very uncertain; assuredly prolonged or heavy irradiation which is likely to produce permanent tissue changes is not justifiable until definite recurrences have appeared.

In the care of the advanced, incurable cases the control of pain is often a most perplexing problem. Irradiation in some form may relieve excessive pain. When this fails and such drugs as aspirin prove of no benefit, it is well to consider nerve block or section before resorting to morphine.

The following statement by W. J. Mixter covers briefly the present status of this procedure:

"Nerve section or nerve blocking seems to help in making the patients more comfortable, and permits of more radical treatment both operative and by irradiation. The cancers of the upper jaw, antrum, and lower jaw and face are the ones most benefited, as the pain is carried through the fifth nerve and severing of this nerve or alcohol injection is a comparatively simple and more or less standardized procedure. If the disease involves the pharynx, floor of the mouth, or neck, the problem is much more difficult on account of the complex nerve supply. These cases are worthy of further study, and we should be able to help a certain number of them.

"Malignant disease of slow growth involving the pelvis and lower spine is frequently very painful, and this pain can be relieved in most instances by section of the spino-thalamic tract in the spinal cord. This operation is a fussy one, but seems to give fairly good results. As a rule, there is little weakness following the operation, although there may be some interference with the bladder and rectal sphincters and usually some ataxia. The operation carries a distinctly low mortality, and is one which should be used more frequently than in the past."

The whole subject of control of pain is one of great interest, and one which I think has been somewhat neglected by the surgeon.

The general medical care is important, and is too often neglected by the radiologists and surgeons The removal of a malignant growth, either by surgery or radiation is, after all, but a small part of the treatment of malignant disease. These patients should be encouraged to return at stated intervals for observation and advice. In this way, recurrences are detected early and treatment promptly instituted.

SUMMARY

1. The effective treatment of carcinoma requires the coöperation of a group of physicians trained in the various specialties, and particularly interested in this disease.

2. Each case should be carefully studied, and a definite plan of treatment decided upon before starting any single form of therapy.

3. Most curable cases are better treated surgically, but the surgeon should not attempt a radical cure where complete removal of the tumor is impossible. These cases are better treated by radiation alone.

4. Pre-operative radiation properly used probably increases the chance of surgical cure. Post-operative radiation has failed to prevent recurrence, and when prolonged has caused permanent damage to the skin.

5. In the treatment of recurrent and in-operable cases, relief of distressing symptoms should be the main object of the treatment. It is usually inadvisable to use heavy or prolonged dosage in an attempt to cure.

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Discussion

Discussion of all the subjects presented follows:

Dr. Harvey W. Van Allen, Springfield: I will confine my discussion to the paper by Dr. Holmes and to a few remarks upon the closing part of Dr. Wyman's as in our laboratory the physiotherapy is done by my Associate, Dr. Powers. Dr. Wyman spoke of light treatment of acne. In my experience mild doses of rather soft x-ray are better in this condition as well as in eczema and psoriasis. I believe there is a logical reason. In acne it is our object to effect the glandular structure in the deeper layers of the skin. Ultra Violet Light does not penetrate deep enough. In psoriasis x-ray, I believe, has a systemic effect as is shown by the fact that after x-ray treatment parts not exposed to the x-ray get well. This is particularly advantageous when the psoriasis affects the scalp, as well as other parts, as exposure of the torso or limbs effects a general cure.

In regard to Dr. Holmes' excellent paper my only suggestion is that he is perhaps too pessimistic. It may be true that the pathologist may report cancer cells in autopsies long after x-ray treatment has effected a clinical cure. But the patient has been happy and contented for a number of years and died of some other malady. I call this a good result. This is just what the medical man is doing in many diseases, as example, Chronic Bright's Disease is seldom cured but we may give the patient many years of life.

In speaking of destructive doses by x-ray we should remember there is a dose that is destructive to cancer cells that can be tolerated by healthy tissue and the Roentgenologist who knows how to regulate his apparatus to such a dose to each case will get success where others fail. Dr. Holmes does not state fully what he means by destructive doses but I believe he will agree with me as I have expressed it.

About pre-operative treatment, we do not do enough of it. Murphy's experiments on mice show that cancer tumors when subjected to x-ray before being transferred to another mouse seldom can be transplanted, while in the control experiments over 90% of transplants took. Why, then, is not pre-operative treatment logical as it practically eliminates the danger of transplantation by the surgeon's knife as well as probably kills any cells inadvertently left behind? Such cells would be very susceptible as their blood supply would have been interfered with. There is no particular delay caused by pre-operative x-ray, as persons seldom are operated upon the day the diagnosis is made and there is no waiting time required after the application of the x-ray before the operation.

I think statistics in regard to x-ray after operation are misleading as in my experience the surgeon has a tendency to refer only the severe or unpromising cases for post-operative treatment. The milder cases are not treated. Therefore, the results of the two classes cannot be correctly compared. I believe in post-operative breast cases, if we use low voltage and light filter on the anterior surface of the chest, where the return is usually in the skin, and heavy voltage on the back and supraclavicular region to reach the mediastinum, we will avoid the possibility of lung fibrosis.

I must congratulate this new section upon the very large attendance and interest shown.

Dr. D. C. Dennett of Winchester emphasized the importance of not relying too implicitly upon the reading of the milliammeter in diathermy treatment. The comfort of the patient is a safer guide and should be carefully watched. "Tell the patient not to expect trouble and to inform you if he feels prickling or is uncomfortable in any way. Experience with two severe diathermy burns leads me to speak of this."

"As I listened to the paper on the treatment of rickets by ultra violet radiation at the Children's Hospital I could not help thinking what a pity it is that any patients have to be treated at the hospital for rickets. It is a preventable disease, there should be no such cases, they should be cured before they get there. The smoke, and dust and moisture in the city atmosphere shut out the ultra violet rays and rickets is very common. This is the field for preventive medicine. Physiotherapy should receive the attention of more regular physicians. It should be taken out of the hands of quacks and applied scientifically by the members of our profession. Insurance companies have been compelled to establish departments of physiotherapy for the treatment of their clients because the physicians

are not equipped to do the work, and the insurance companies will not let them treat their cases unless they are familiar with this department of medicine. I submit that the third* department of medicine, physiotherapy, is absolutely essential and that our patients are entitled to its benefits. Any man who practices medicine today without the use of physiotherapy is not giving his patients what they are entitled to and what they are going to have when they can get it. Harvard University offers a graduate course in physiotherapy. I took that course under Dr. Granger at the Boston City Hospital. I found that the rank and file of Harvard Medical School graduates whom I met knew nothing about what their own university was doing in scientific physiotherapy. Sometime before the war the City Hospital was treating a dozen or fifteen cases a day in their department. Now, under Dr. Granger, they are treating 225 to 250 a day, every one referred by a physician or surgeon. The point I wish to make is this—the time has come for the regular physician, the scientific man, to familiarize himself with this rapidly advancing department of medicine and treat the patients who need it himself—do not compel them to seek the help from other hands."

Dr. Frederick W. O'Brien, Boston: I would like to compliment the speakers on their papers and congratulate the Society on such a well-balanced program.

I was interested in Dr. McFee's paper, and particularly in the cases of pneumonia that he spoke of, some seventeen, treated with diathermy. For my own information, I would like to know how he studied those cases, whether by X-ray before and after diathermy, and how they were classified as to type and kind of pneumonia, and whether or not any of them were complicated by influenza. These things must be known before one can properly evaluate the treatment.

Dr. Bovie's paper opens up a tremendously interesting subject to me, opens up the whole subject, of course, of the biology of our treatment. He just hinted something about the phototropic effect produced in the blood stream by radiation of the electro-magnetic end of the spectrum. This blood stream effect may be the whole crux of the treatment situation. Some few years ago, just after the advent of high voltage therapy, on general biological principles, not because I was not willing and equipped to do the work, I condemned prolonged high voltage radiation, and my feeling has not changed any. If it is the escharotic effect that we must obtain in the treatment of malignant disease, then we are uneconomic in using radium and X-rays when the actual cautery will produce the same result. All of you, I am sure, have seen in practice what makes Dr. Bovie's theory plausible. When you treat one part of the body by X-rays and are careful to protect the remaining parts from the action of the rays, you see the entire body respond to the effect of radiation, as in adenopathy, psoriasis, etc., it seems most likely that one has produced a systemic effect. I am in hopes that Professor Bovie will elaborate at some length his ideas on the photo effects on the blood stream.

I was interested in Dr. Wyman's paper. I do not think it is at all clear, to obtain the results described by him that it is necessary to confine ourselves to the quartz light. Certainly, the men in this country who have had very wide experience with light therapy, at least as far as the treatment of tuberculosis goes (I have in mind non-pulmonary tuberculosis) all prefer the carbon-arc lamp because of its particular spectrum.

I was very glad to hear Dr. Holmes say that when ulceration and glands were present in malignant disease, surgery should not be used. I have felt that way for a long time and know that patients live longer following X-ray therapy and radium therapy in the presence of an ulcerated breast lesion with glands than they do when surgery is employed.

DISCUSSION OF DR. HOLMES' PAPER

Dr. McFee: I would like to ask Dr. Holmes if he has made any observation in the use of ultra violet radiation in conjunction with his treatment by X-rays, and if so if it has made any difference in the prevention or control of X-ray sickness?

CLOSING DISCUSSION OF DR. MC FEE'S PAPER BY DR. MC FEE

Dr. O'Brien asked as to whether these cases of pneumonia referred to were typed, and also whether any of them were complicated by influenza. Some of these cases were treated in the local hospital in Haverhill and some treated at their homes, and of course we all appreciate the lack of facilities in the smaller communities for accurate checking up of our treatments and results, and these seventeen cases referred to in the paper were not typed. Some of them were complicated by influenza. The cases were all of them checked up by consultants and the diagnosis confirmed in that manner. Some time ago a large series, I think some two-hundred cases of pneumonia treated at the New Haven Hospital, were reported by Dr. Stewart and those cases were all of them typed, and Dr. Stewart's report was that in those cases of pneumonia treated by diathermy the mortality rate was 16%.

The doctor from Winchester, I did not get his name, mentioned that we should not pay too much attention to meter reading in using diathermy, but that we should be governed largely by the sensation of the patient to the heat effect.

*Medicine being divided into three departments, i. e., medicine, surgery and physiotherapy.

The sensation of the patient is a fairly good guide. However, you must have in mind that sometimes there are anaesthetic areas and that on this account we should exercise even greater care in making our applications, so that we will not get the results referred to by the doctor; that is, the burning of the skin.

In treating conditions like pneumonia oftentimes it is a good plan to have an assistant hold the electrodes in exact contact with the skin so that there is no chance of their slipping and forming an air space thus creating an arc which will invariably burn.

I am only sorry that time available does not permit the proper presentation of the subject of diathermy before this group. There are a great many interesting case records that might be reported, and the surgical phase of dithermy also is a very interesting topic for discussion. I appreciate the opportunity for what little chance we have had, and if the various measures of treatment by physiotherapy are given the consideration they deserve, in deciding the best procedure for the care of the sick and injured, much more will be accomplished for the welfare of our patients.

ORIGINAL ARTICLES

INFLUENZA IN MASSACHUSETTS*

BY HERBERT L. LOMBARD, M.D., AND CARL R. DOERING, M.D.

DURING the late winter and early spring of 1926, influenza in a comparatively mild form was prevalent throughout the country. While the influenza deaths in Massachusetts were not many, their seasonal distribution was significant, as the peak of incidence fell in early spring. A similar occurrence has not been noted since the spring of 1918.

As the mild spring epidemic of 1918 was followed by the severe fall epidemic of the same year, it has been suggested from various sources that we might expect similarly in the coming winter another major epidemic. In the present study we wish to consider some facts that may throw light upon the probability of such an outbreak.

Eichel[1] in his study of pandemic influenza found that between 1510 and 1915 there were four pandemic epochs averaging 19.8 years in length. Each of these was composed of several epidemic waves. Prior to an epoch, there is an increasing severity and frequency of local outbreaks for a number of years. These preliminary outbreaks seem to begin after a series of years entirely free from epidemics. The fifth epoch containing the epidemic of 1918, began in 1915, and according to Eichel, outbreaks should be anticipated during the ten to twenty years following 1915.

It is impossible to ascertain the amount of influenza in a community at any one time. The term influenza is often used to cover a variety of disorders. We can only speak here of what is called influenza in reporting morbidity and mortality. A fair estimate of the prevalence of influenza might be obtained by a house to house canvass, but even then errors in diagnosis might occur. On the basis of present morbidity reporting it is impossible to obtain an accurate estimate. In inter-epidemic years, the tendency is not to report minor cases. In epidemic years cases other than influenza are often reported. As a result, the morbidity rate can only be used as a rough index of the true condition.

The mortality records are far more accurate than those for morbidity, but errors often occur in them. Many cases, which are primarily due to influenza, are certified as pneumonia or bronchitis and unless influenza is mentioned as a contributory cause, the relationship is lost. Moreover, as the case fatality in influenza appears to be decidedly variable, the mortality records cannot be regarded as an index of prevalence. In making this study, it was, however, deemed advisable to deal largely with mortality records despite the possibility that epidemics of mild influenza may be lost from the discussion. The mortality records from influenza alone, from influenza combined with lobar pneumonia, and from a group composed of influenza, bronchitis, and all forms of pneumonia have been used; this latter group is designated as "the respiratory group". During influenza epidemics, a sharp rise in respiratory mortality usually occurs, and this, together with inaccurate diagnosis, gives ground to the belief that mortality in the respiratory group is a better index of the situation than is that of influenza alone.

The mildness of the cases so far in 1926 makes it difficult to estimate their extent. *The Weekly Health Index*, issued by the United States Bureau of the Census, shows that for a group of cities with a total population of 29 millions, the crude death rate was appreciably increased. A sharp rise occurred in the middle of February, reaching a peak in the week of March 27, when the crude rate was 19.4 as compared with 14.8 in 1925.

The deaths in these cities for influenza and

*From the Massachusetts Department of Public Health and Department of Vital Statistics, Harvard School of Public Health.

pneumonia from February 20 to May 1 were as follows:

Week ending		Influenza	Pneumonia (all forms)
Feb.	20	266	1567
	27	240	1543
Mar.	6	294	1639
	13	417	1982
	20	429	2272
	27	587	2280
Apr.	3	534	2104
	10	424	1719
	17	303	1487
	24	240	1224
May	1	184	1085

The Health Officers' News Release, issued by the United States Public Health Service, gives the disease appeared simultaneously in widely separated sections of the country, and then disappeared to reappear in the same general localities several weeks later. Influenza was in the Texas stations in January, but did not reach those in northern New York and New England until several weeks later.

In Massachusetts, during the first eight weeks of 1926, there was reported an average of 12 cases of influenza a week. During the first week in March there were 31 cases, the second week in March 65, the third week 272, and the fourth week 590. From then there was a gradual decrease to 17 the week of May 16. These cases have been well distributed throughout the

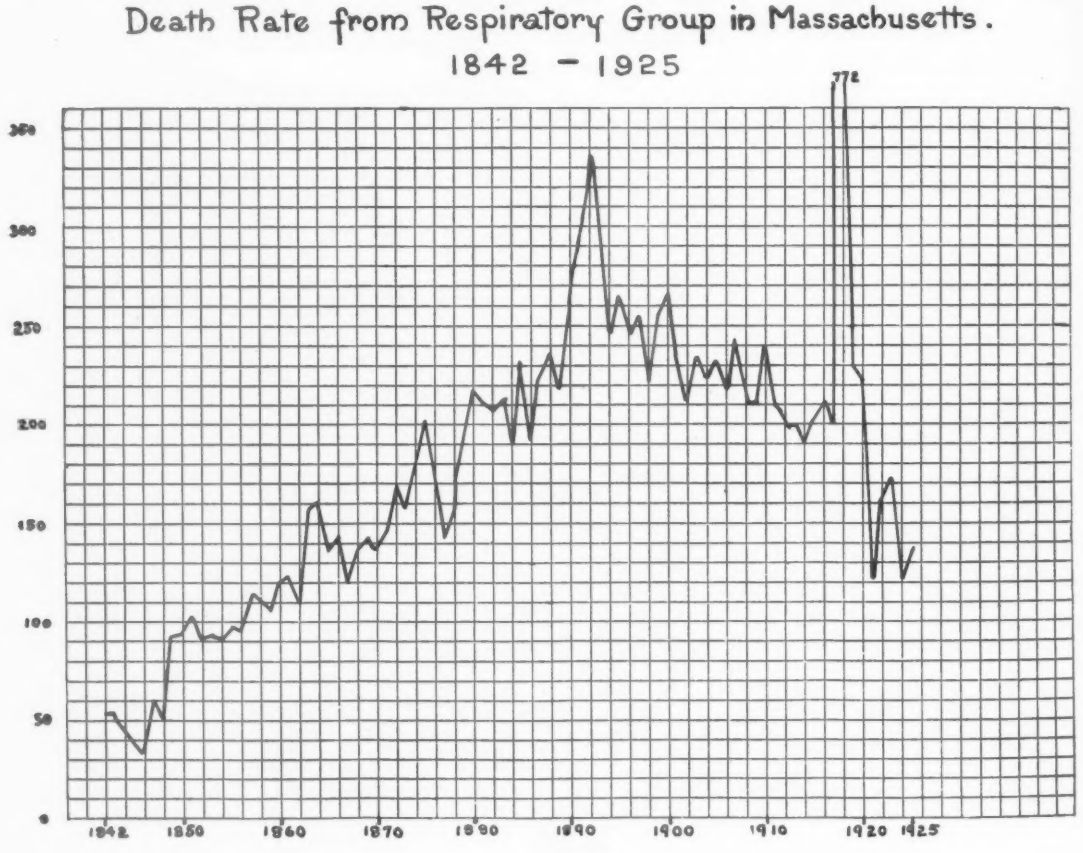

CHART 1.

the morbidity report as furnished by the various States. From these figures can be obtained a rough index of the prevalence throughout the country. They show that in many of the Southern States an increased rate from influenza appeared in the latter part of January and February, while in the majority of the Northern States it was noted early in March. The peak occurred on an average between three and four weeks following the first indication of increased prevalence. Apparently California reported an increased prevalence one and two weeks earlier than other States and reached its peak the third week in January. The current statistics of the United States Army state that State. There is no available means of estimating the extent of the outbreak, but the general impression is that it was widespread and the reported cases represent only a small fraction of the total number. The reported cases of lobar pnuemonia were 499 in February, 953 in March, 933 in April, and 456 in May.

As yet, the Massachusetts mortality records are available only for the reportable diseases for 1926, so comparison with other years can be made only on the basis of influenza and lobar pneumonia. These diseases were within normal limits in January and February but above for March and April. The deaths from these combined diseases for March were 665 and for April

653. This number of monthly deaths has been exceeded on many occasions, and if they had occurred in the early winter would have aroused only passing interest.

The fact that they occurred in late winter and early spring is the outstanding feature. No March since 1919 has had more deaths from these combined diseases and no April since 1918. To determine the significance of this occurrence, the reports of the State Registrar of Vital Statistics have been consulted from the first publication to the present, covering the records from 1843 to 1925, both for influenza and for the respiratory group.

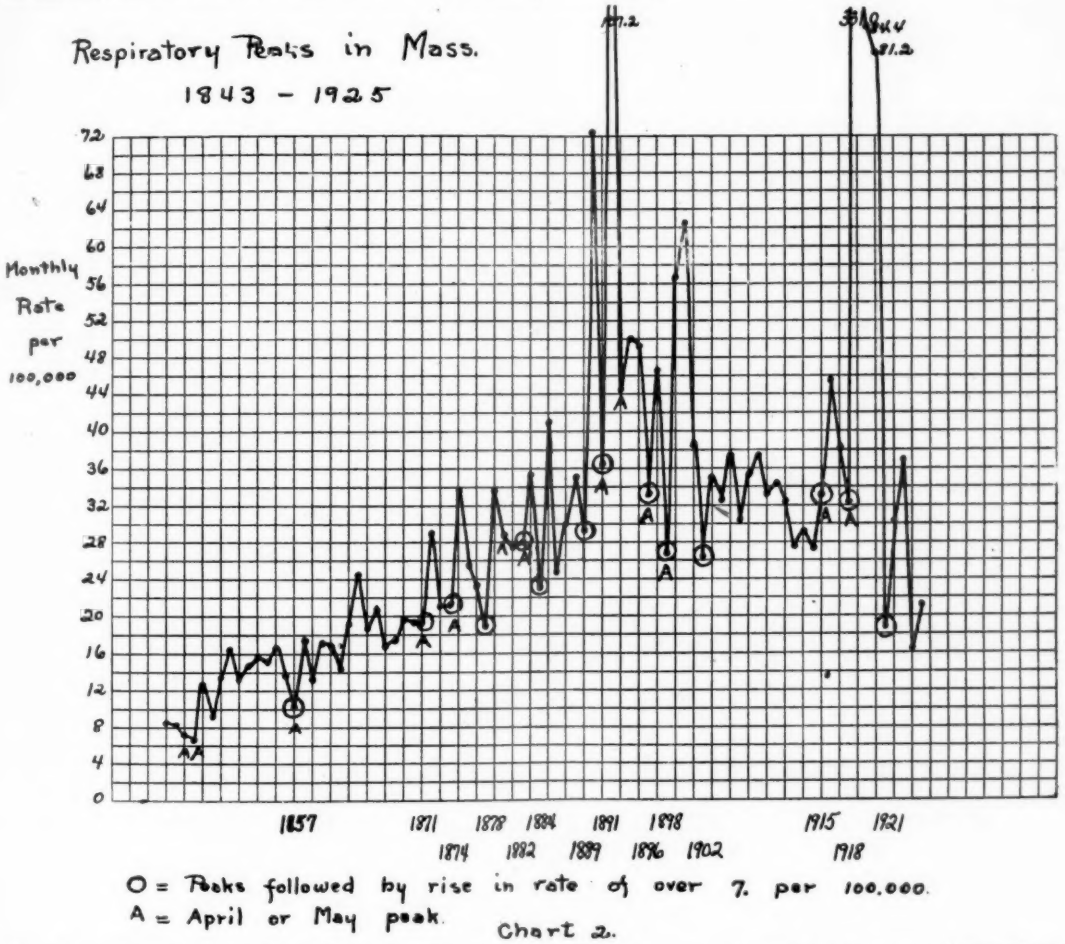

Chart 2.

Deaths from influenza have been recorded each year since the registration of deaths was first begun in Massachusetts. From 1843-1880 the records of deaths in each year was small, the highest being 92 in 1857 and the lowest 8 in 1843. The annual death rate for the respiratory group from 1843-1925 is shown in Chart 1. The striking upward trend to 1891 and equally striking subsequent downward trend (interrupted by the explosion of influenza in 1918) quite overpower the fluctuations from year to year. The cause for the decided change in the trend of this group in 1891 is impossible to ascertain.

From 1843-1925 monthly records have been obtained for influenza alone and the respiratory group (Table 1).* In each year that month which shows the highest rate has been called the peak, and these peak rates have been plotted in Chart II. (In three instances the December rate was higher than any of the following winter months, and these peaks have been used rather than the lower ones that follow. This makes two peaks in 1863, 1907 and 1918, and no peaks in 1864, 1908 and 1919. An additional peak was assigned to 1918 due to the high October rate.)

The curve of peaks is more irregular than that of the annual curve and the trends stand out less clearly, but one may still see the rise from 1843 to the pandemic period of the early '90's, and perhaps the downward trend since that time. It should be remarked that the highest monthly rate does not inevitably and always mean that the true peaks of the respiratory group fell in that month. For example, in 1887 the rates for January till May are 27.3, 23.9, 30.0, 29.9, 22.2 and it appears that the peak fell so near to March 31 or April 1 that discrimination between the two months could not be made without the possession of weekly figures. In the absence of weekly figures, we have had to assume that the peak of the deaths fell in the highest month. From 1843 to 1925

*Tables showing the number of cases of influenza will appear in reprints of this article and will be available for those who would like complete statistical records.

inclusive (83 years) the respiratory group had 84 peaks, the lowest with a rate of 6.7 in April, 1846, and the highest with a rate of 331.0 in October, 1918 (Chart II). The median rate was 27.8.

In the *London Lancet* of November 8, 1919, Dr. John Brownlee[2] predicted the 1920 epidemic of influenza. This prediction was based on his findings that influenza epidemics recurred at intervals of thirty-three weeks, provided that the thirty-third week did not fall between June and December, in which case the recurrence would be expected in sixty-six or ninety-nine weeks. He emphasized the fact that the intervals were not exact and that a month's leeway might be expected.

In studying the Massachusetts figures (Table 1), intervals of seven, eight, nine, fifteen and sixteen months were considered to coincide with Brownlee's theory. Prior to 1890 there were so few deaths reported as being due to influenza that monthly intervals between influenza peaks could not be well determined. The respiratory curves showed a nine months' interval between peaks in 1863 and a fifteen months' interval in 1880. These were the only instances prior to 1890. These findings might indicate that this period was free from influenza epidemics, that reporting influenza was very poor, or that Dr. Brownlee's theory of periodicity did not hold true in Massachusetts. We are inclined to favor the first of these possibilities, although the other two cannot be definitely ruled out.

The 1890, 1891, 1892, and 1893 peaks showed sixteen, eight, fifteen and nine months' interval for both the respiratory and for influenza alone. In 1898 the respiratory group had a nine months' interval and influenza an eight. In 1899 influenza had a fifteen interval. In 1907 the respiratory group had a fifteen months' interval, but this did not occur for influenza alone. In 1915 both the group and influenza showed a nine months' interval. In 1917 the respiratory group had a fifteen months' interval. In 1918 influenza alone had a seven months' interval. The interval between the April and October peaks of the respiratory group in 1918 was six months, but between the April and December peaks, eight months. The 1920 epidemic was sixteen months' after the October, 1918, but only fourteen from the December one for both the group and for influenza. Since 1920 there has been no recurrence of the eight months' interval.

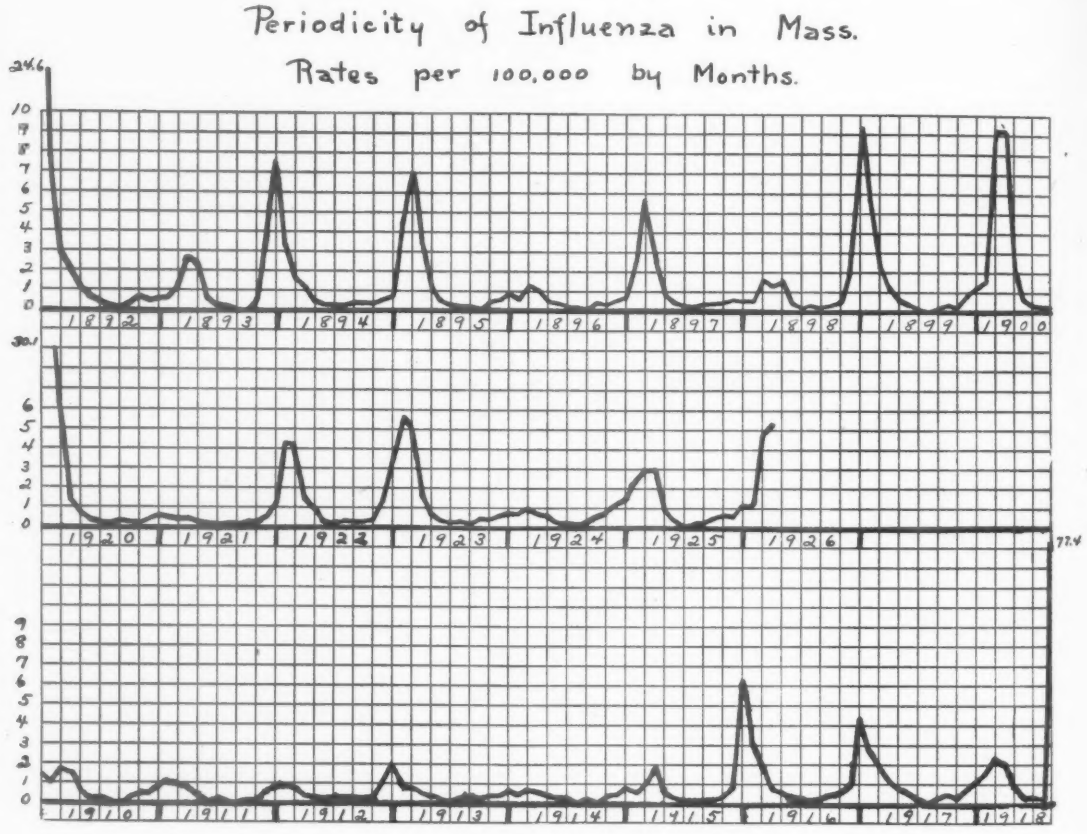

Chart 3.

If influenza is studied by months (Chart 3) a certain similarity between the periods following the 1890-1892 epidemic and the 1918-1920 epidemic will be observed. It will be noted that

the graph following 1892 somewhat parallels that graph from 1920 to the present time. Both graphs show waves in the influenza rate which run somewhat parallel courses. The former has been considered by Eichel as a part of the 1889 epoch; the latter may be considered as similar waves in the epoch beginning in 1915. Preceding the 1889 epoch the influenza rate showed very little fluctuation. The same is true of the period prior to 1915. It is unsafe to make inferences from two samples only, but if the factors which influenced the influenza rate before and after the last two pandemics continue, it can be inferred that no major epidemic of influenza is due for several years.

There have been eighty-four peaks in the respiratory graph between 1843 and 1925 inclusive (83 years). The months in which these peaks occurred are represented in Table 2.

TABLE 2

Month	Total peaks	Peaks followed by a rise over 7 per 100,000 to the next monthly peak	Peaks preceded by a rise over 7 per 100,000 to the next monthly peak	Other peaks
October	1	0	1	0
December	3	0	0	3
January	11	1	5	5
February	14	0	2	12
March	42	4	6	32
April	12	8	0	4
May	1	1	0	0
	84	14	14	56

These distributions show that there is an apparent tendency for the peaks which are followed by a rise in rate of over 7 per 100,000 to occur in the late winter and early spring months, while the peaks, which are preceded by such a rise, occur somewhat more frequently in the early winter. The rise in rate of over 7 per 100,000 was arbitrarily chosen after inspection of a graph formed by plotting the eighty-four peaks (Chart 2). A rise of this degree was felt to be significant while smaller ones were not. Of the thirteen April or May peaks since 1842, nine were followed by rises in rates of over 7 per 100,000 while four were not. If the entire period from 1842 to 1925 be divided into two groups of forty-two peaks each, the group preceding 1885 would have four of the seven April peaks followed by a rise of over 7 per 100,000, while the group from 1885 to 1925 would have five of the six April or May peaks followed in the same manner.

Over the period studied, there have been eleven monthly peaks with a rate over 45 per 100,000. This rate has been arbitrarily chosen to be sufficiently high to constitute an epidemic. These peaks occurred in January, 1890; January, 1892; January, 1894; February, 1895; March, 1897; January, 1899; March, 1900; January, 1916; October, 1918; December, 1918; and February, 1920. Six of these high peaks were preceded by April or May peaks, while the peaks of 1890, 1895, 1900, 1920, and the December one of 1918 were not. The 1895, 1900, 1918, and 1920 peaks were parts of epidemics that had been preceded by spring peaks. The 1890 peak was preceded by a March peak.

Spring peaks can occur in late March, April, or May. The available mortality statistics are tabulated only with monthly distribution and there is no way of ascertaining from them whether the March peaks were early or late. In the following association table all March peaks are omitted and only the peaks considered which can definitely be classified as spring peaks. By placing a part of the above data in an association table and computing the association coefficient, we obtain .42 ±.07. This figure is significant statistically.

Peaks below 45	Peaks above 45		
7	6	13	Peaks preceded by an April or May peak
66	5	71	Peaks not preceded by an April or May peak
73	11	84	

In the spring of 1918, there was in many parts of the country an April or May peak in the respiratory group. Frost[3] writes: "This occurrence has, I believe, a definite significance in relation to a coincident prevalence of influenza, and to the subsequent development of the influenza pandemic. . . . The rise in mortality from this group of etiologically heterogeneous diseases in the spring of 1918 is so sudden, so marked, and so general throughout the United States as to point very clearly to the operation of a single definite and specific cause, something largely independent of meteorologic and other local conditions. The observed occurrence of local epidemics of influenza at that time in widely scattered localities, the intimate association established at Camp Funston between the epidemic of influenza and pneumonia, and the subsequent development of the influenza pandemic, all indicate that the increased pneumonia mortality of March and April, 1918, was the consequence of a beginning and largely unnoticed epidemic of influenza, the beginning in this country of the great pandemic which developed in the autumn."

Apparently spring peaks in the respiratory diseases tend to precede higher peaks in the following fall or winter. The maximum rates in the last two pandemics have been so preceded

in Massachusetts. From the data available it would appear that the influenza of pandemic epochs comes in a series of waves which cover a number of years. An epoch is followed by a period in which there is very little influenza mortality. Following these periods occur mild influenza epidemics, and, later, major epidemics. In the spring of 1926 there has been an increase in the influenza death rate, but the course of influenza since 1918 makes the peaks appear like epidemic waves of that epoch.

We are, therefore, of the opinion that the respiratory group, including influenza, may be unduly prevalent in Massachusetts during the winter 1926-27, as in 1916 or in 1921 and 1922, possibly as in 1899 or 1900, but there seems to be no reason to expect any great calamity such as that of 1918 or even that of 1891-93.*

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1 Eichel: The Long-Time Cycles of Pandemic Influenza. Quarterly Publication of the American Statistical Association, Dec., 1922.

2 Brownlee: The Next Epidemic of Influenza. Lancet, 2-856, Nov. 8, 1919.

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*In the original paper tables of death rates of the population from the respiratory group composed of pneumonia (all forms), bronchitis and influenza, and from influenza alone in Massachusetts 1843-1925 inclusive were submitted. These tables will be included in reprints which will be of interest to epidemiologists.

A SPECIAL DIET FOR PATIENTS WITH PERNICIOUS ANEMIA*

BY WILLIAM P. MURPHY, M.D., AND GEORGE R. MINOT, M.D.

In the issue of August 14, 1926, of the *Journal of the American Medical Association* (Vol. 87, page 470) we reported upon the distinct improvement in the health of patients with pernicious anemia, partaking of a special diet—one composed of foods rich in complete proteins—particularly liver—and containing an abundance of muscle meat, fruits and green vegetables and low in fat. In order that physicians may advise readily this diet for patients, it is described below in greater detail than in the paper referred to above.

The *daily* requirements of the diet in order of assumed importance are:

(1) *Liver* (calves', beef, chicken) or kidneys (lamb) freshly cooked. At least 120, preferably 200 or *more*, grams (cooked weight). Cook without fat; broil, bake, boil, mince or make into soup.

(2) *Fruits*, preferably fresh — *especially* peaches, apricots, pineapple, strawberries, oranges, and grapefruit—about 400 grams.
Raisins desirable; allow them to be eaten freely.

(3) *Red muscle meat*, trimmed free of fat, freshly cooked; 125 grams or more. Beef heart desirable.

(4) *Vegetables* containing 1 to 10 per cent. of carbohydrate, preferably fresh; cooked or raw. Not less than 300 grams.
Lettuce, spinach, asparagus, cabbage, and tomato especially desirable.

(5) *Fats restricted*, not over 70 grams. Avoid cheese, bacon, fried food. Allow but little cream and butter and not over one egg. Use mineral oil for salad dressings.

(6) Avoid grossly sweet foods, yet allow sugar sparingly.

(7) Starchy foods, as cereals, potato, breads, add to suit individual desires, but not to exclusion of the requirements given above. The starchy foods best be crusty or dextrinated. Whole wheat toast is desirable.

(8) Milk best be limited to about 240 grams.

(9) Avoid excess of salt.
Tea and coffee as desired.

Ideally all food should be weighed. The liver is essential and must be weighed at first. After the patient understands the approximate quantity of the different foods to be taken their amounts may be estimated.

The food must be palatable and as attractive as possible. The art of fine cooking and serving combined with persuasion will be necessary often to get the patient to eat the food desired.

Several small meals a day rather than three may be found suitable. The exact condition and desires of each patient must never be neglected; for instance, a persistent diarrhoea may necessitate that less fruit be eaten and that vegetables be puréed; while allowing the patient his choice of the form or type of required food may enhance his progress.

When the patient is unable to take much food, it is important that he eat some liver or kidneys (chicken gizzards may be substituted) and fruit, even if no other food is taken. Then gradually add meat and green vegetables. The starch foods are to be given in accordance with the amount of the other foods eaten. The patient should be expected to take the full diet within about two weeks after commencing it.

Present information suggests that the patient should continue with this sort of diet even though his red blood cell count remains high.

The full diet should contain for the average person about 2500 calories; the protein being about 135 grams, the carbohydrate about 340 grams, and the fat not over 70 grams. This is the approximate composition of the food given in the sample menu below.

Breakfast

Approximate weight in grams	
Liver or kidneys, broiled	100
Oatmeal, 2 heaping tablespoons cooked, or dry meal	18
Milk, 3 tablespoons	45
Sugar, 2 level teaspoons	10
Toast, 3 slices (each slice 4x2x¼ inches)	30
Butter, 1 level teaspoon or a piece 1x1x½ inches	5
Fruits, choice of:	
(a) Orange, average size	120

*From the Medical Clinic of the Peter Bent Brigham Hospital and the Medical Service of the Collis P. Huntington Memorial Hospital of Harvard University.

(b) Strawberries, 5½ tablespoons	180
(c) Grapefruit, ½ of one very large one	200
(d) Peach, 1 large one	120

Dinner

Beef, steak or roast, trimmed of fat; a very large serving	120
Vegetables, freshly cooked, as spinach, string beans, cabbage, tomato, etc.; 2 average portions or 5 to 8 tablespoons	250
Potato, baked, medium sized	130
Bread, 2 slices (each slice 3x4x½ inches)	70
Salad: Pineapple, 2½ slices, of size in cans	140
Lettuce, big helping	75
Pudding made of:	
(1) Gelatine, 1 teaspoon (dry weight)	2
(2) Rice, boiled, 2 heaping tablespoons	160
(3) Raisins, 20 large ones	50
(4) Milk, 2 tablespoons	30

(Fruits may be put into such a dessert and raisins eaten separately.)

Supper

Liver soup, composed of:	
(1) Liver, minced	100
(2) Milk, 1 tumblerful	220
(3) Flour (white), 1 teaspoon	4
(4) Butter, 1 rounded teaspoon or a piece 1x1x⅞ inches	10
Lamb, roast, without fatty parts, 2 small slices	60
Macaroni, boiled, 3 tablespoons	150
or	
Potato, small one, or rice, 1 heaping tablespoon	80
Vegetables, fresh, 2 average portions 5 to 8 tablespoons	250
Uneeda biscuits or triscuits, 4	25
Butter, 1 level teaspoon or a piece 1x1x½ inches	5
Choice of:	
(a) Strawberries, 7 tablespoons	225
(b) Orange, large one	150
(c) Apricots, or prunes, stewed, 2 tablespoons	100
Sugar, 2 heaping teaspoons	20

A vegetable soup could be taken in place of the liver soup and the liver eaten in the following form: Mince it and mix with rice or potato and the allowance of butter, and stuff into green peppers.

The following menu gives an example of a suitable diet for a day with fewer calories than that given above. The food listed contains about 2050 calories, derived from about 115 grams of protein, 65 of fat, and 250 of carbohydrate.

Breakfast

Approximate weight in grams

Fruit, choice of:	
(a) Orange juice, from 2 oranges	130
(b) Grapefruit, 1 whole medium sized one	240
(c) Strawberries, 5½ tablespoons	180
Shredded wheat, 1 biscuit	30
Milk, 2 tablespoons	30
Sugar, 1 level teaspoon	5
Beef, minced, 2 heaping tablespoons	75
Cream, 20 per cent., 4 tablespoons	60
Toast, 2 slices (each slice 4x2x¼ inches)	20
Butter, 1 rounded teaspoon or a piece 1x1x⅞ inches	10

Luncheon

Liver, broiled	120
Lettuce or cold slaw, large helping	80
Potato, cold, sliced, or baked, hot, 1 small one	80
Tomato, stewed, 5 tablespoons, or raw, 2 medium sized ones	150
Cauliflower or Brussels sprouts, an average portion or 3 tablespoons	130
Zwieback, 2 pieces	30
Butter, 1 level teaspoon or a piece 1x1x½ inches	5
Apricots, stewed, 3 heaping tablespoons	120

Dinner

Soup, consomme (any amount desired), mixed with sieved liver (flavor with spice)	75
Mutton, 2 large slices, trimmed of fat	100
Beets or peas, 3 tablespoons	100
Potato, boiled, average size	130
Spinach, or string beans, an average portion or 3 to 5 tablespoons	150
Butter, 1 level teaspoon or a piece 1x1x½ inches	5
Toast, 2 slices (each slice 4x2x¼ inches)	20
Blanc mange, 2 heaping tablespoons (made of ¼ cup Irish moss, 2 cups milk, 1 tablespoon cream, 20 per cent., 2 teaspoons sugar)	100
Blueberries, 5 tablespoons, or apple sauce with 1 level teaspoon (5 grams) of sugar: 2 tablespoons	80

(Fruit could be mixed with blanc mange.)

THE KEY-MAN IN CANCER CONTROL*

BY GEORGE A. SOPER

ALTHOUGH there are today few subjects more often discussed by medical men than cancer, there is one angle from which this question is not talked about as often and as definitely as the situation requires. I refer to the part which should be taken by the various persons upon whose coöperation dependence must be placed to prevent as much suffering and death from this disease as the present state of knowledge permits.

For the last thirteen years the American Society for the Control of Cancer has been teaching the general public the danger signals of cancer: the sore that will not heal; the suspicious lump, particularly in the breast; the unusual and unnatural discharge from any of the orifices of the body; the persistent, intractable and inexplicable case of indigestion.

Men and women have been told the significance which attaches to these conditions and urged, when any of the signs appear, to go immediately to a physician. It has been estimated that half the population of the United States have received the Society's message.

There is some difficulty in instructing the public on the subject of cancer. Many people *instinctively* shrink from the very word. A woman who has the reputation of being well-informed upon most topics remarked a few days ago that she was afraid to give much attention

*Read before the Alumni Association of the Sloane Hospital, New York.

to the subject of cancer, because she believed that thinking about it had a good deal to do with its causation.

What the average woman does is to wait until pain or some other compelling impulse forces her into action. It is then usually too late for the doctor to save her life, as every physician knows.

We need to have the danger signals discovered more often and acted upon more promptly by physicians. Laymen cannot be perpetually on the lookout for cancer without becoming unduly alarmed about it. Physicians can, on the other hand, keep cancer constantly in mind and become keener and more capable in detecting it in its early stages. They can do better than this, and more than this. They can be alert to discover and remove the conditions which so commonly lead to cancer.

In carrying on its campaign the Cancer Society has found it much easier to send patients to the doctors than to be certain that the doctors will treat them skilfully when they get there. The public is willing to submit to periodic examinations for the detection of any remediable physical defect which may lead to serious consequences, and it is probable that it could be induced to undergo periodic examinations for cancer. In fact, a well known gynecologist of New York has a considerable number of women who come to him regularly once a year for examination and report as to cancer, and it is his opinion that if every woman would follow this practice and do what he advises, the death rate from cancer of the uterus could be reduced over fifty per cent. This would result in a large saving of life.

In the same way savings could be made in other directions. For example, few persons would question the statement that approximately one-half of the lives now lost through cancer in the following locations could be saved, if persons would submit to periodic examinations for the detection of cancer in its earliest stages, or for the correction of conditions which commonly precede cancer, and provided the physicians did their full part: Among men, cancer of the buccal cavity and skin, and among women, cancer of the buccal cavity, genital organs, breast and skin.

Cancer in the locations indicated for men constitutes 12.4 per cent. of all fatal cancers in the male sex and cancer in the locations indicated for women constitutes 44.3 per cent. of all fatal cancers among females. These figures are based on Schereschewsky's recent report to the United States Public Health Service after several years of study.

What is the reason for the difficulty which has been found in reaching the whole medical profession with the message of cancer control? Why is it so much easier to send people to physicians than to have them skilfully attended to after they apply?

Some persons have said the difficulty is very much the same with cancer as it was some years ago with appendicitis. It was simply inertia, we are told. Then the public learned the essential things which ought to be done and compelled the doctors to do them. Perhaps not all doctors read a great deal, or keep up with the literature, as the saying is. Perhaps there are practical difficulties of an insurmountable character connected with cancer. Let us see. Let us follow through some definite cases.

We may picture to ourselves a country village. The scene might as well be laid in the middle of Boston, but it is more convenient to think of it as in a rural district. A man has cancer of the skin, the easiest form of cancer to recognize in its early stages. It ought to be possible for the man himself to make a pretty safe and certain diagnosis. He goes as soon as his apprehensions are aroused to see his family doctor. What is the doctor to do? Comparatively few general practitioners are qualified to perform the surgical operation which is required. The man ought to be referred to a surgeon. Any surgeon worthy of the name should be able to remove the cancer, if it is in an early stage.

Does the family doctor send the patient promptly to a surgeon? Often he does not do so. He watches the case. Perhaps he has his own ideas about the value of X-rays and tries them. Not infrequently he is tempted to try a little radium if he has it or can borrow it. Possibly he experiments with some serum that has been sent to him. Maybe he uses a little lead. Often there is delay until the case is beyond control.

So much for cancer of the skin. Is it better when there occurs the persistent bleeding, the sore mouth, the husky voice, the irregular bowels, the peculiar lung trouble, the unmanageable indigestion?

The proper course of action in cancer of the buccal cavity is illustrated by some recent correspondence between a dentist in Alabama and the head office of the American Society for the Control of Cancer. The dentist wrote that in doing some work upon the teeth of one of his patients he discovered what he thought might be a cancer. He referred the patient to a surgeon in his home town and the surgeon expressed the opinion that it was indeed a cancer. The patient returned to the dentist and asked for further advice. The dentist put the matter up to the Cancer Society.

Was this a case for a general surgeon? It was not. It called for the skill of an expert. There was none in that part of the country where the patient lived. The dentist did not know where one could be found without sending his patient a great distance. The Society advised the dentist to have the patient go to the

Albert Steiner Ward of the Brady Memorial Hospital of Atlanta, where there was surgical skill, radium equipment and all the other resources which might be required for the proper treatment of the case.

This raises the question: What kind of medical skill should be available for cancer? Should we have cancer specialists, persons who have sufficient knowledge and skill to treat cancer properly wherever it occurs in or on the body, or should the cancer patient be put in the hands of the physician who is a specialist in dealing with particular organs?

There is much to be said on each side of the question but the weight of the argument seems to be in favor of the course which is the more practicable. Perhaps in the years to come we shall have many cancer specialists in the medical profession; but today we have few. But we have surgeons, and among these surgeons gynecologists and laryngologists and so on; and among these, men who have had an unusual amount of experience and skill in treating cancer.

To give proper attention to all cancer patients is beyond the unaided ability of any one. In any but the simplest cases, team play is required among a number of definitely trained and experienced persons. First in the team is the family doctor, next the surgeon or radiologist. Not the least is the pathologist. And then, again comes the family doctor.

To handle cancer cases is properly a hospital job and there are few hospitals that can do the best possible for their patients unless they are especially equipped for cancer.

Every case calls for much careful clerical work. The facts and circumstances about each must be recorded and the patient followed up. And this must be done from time to time so long as the person lives.

Who is to see that all this is done? The family doctor. He is the only one who can do it. He is the person, and the only member of the cancer team, who is in a position to do so. He, above all others, has the interests of his patient permanently at heart. He it is who should see to it that his patient gets into the proper hands to begin with and it is back to him that the patient must come when the others have done everything possible for him; and this is so whether the patient gets well or not.

The proper role of the family doctor, then, is that of the key-man in cancer control. At first, he is the guide, philosopher and friend. The more obvious cases he can, of course, diagnose and with him the old adage holds, that the more apparent the symptoms, the more certain the diagnosis, and the more hopeless the case. He must know where to send his cancer patients, when it is not too late to send them anywhere. The obviously incurable he should manage himself. There are too few places where he can send the incurables and there is not a little to do in managing them properly at home.

The care of incurable cancer patients is a great and greatly neglected subject. It is absurd to say we should have none. Medical science will have to advance to a point beyond anything now in sight before, with the utmost care and skill and vigilance and the best of coöperation, we can cure more than a certain proportion of those who are attacked.

The family physician should learn all the latest methods which he can himself employ to determine whether a growth is or is not malignant, but more important than this, he must cultivate an attitude of mind and acquire a fund of information which will cause him with promptness and good judgment to refer his patient to the right quarter when doubt arises or when radical treatment is indicated.

This subject of delay has greatly exercised the leaders of the movement for cancer control for a long time. It is their constant endeavor to reduce the time lost by waiting to see what will happen. The Cancer Commission of Pennsylvania, which has been in existence for 16 years, has made a study of the delays due to the patients, between the discovery of the first signs and the earliest visit to the doctor's office, and the delay in applying the treatment required which could properly be attributed to the doctor.

The report of the Cancer Commission, which was issued in 1923, makes very interesting reading. The Commission found that in 1910 the following delays occurred, the figures being averages of a large number collected from all parts of the state for the year in question. For superficial cancers, the average time between the first symptoms and the operation was 18 months, and the time between first consulting the physician and the operation was 13 months. In 1923, 13 years later, after educational work had been done, the delay between the first symptoms and the operation was 14.6 months and the average time between first consulting the physician and the operation, 4.5 months. With deep-seated cancers the average time between the first symptoms and the operation was, in 1910, 14 months, and in 1923, 8 months. The average time between first consulting the physician and the operation was, in 1910, 12 months and in 1923, 3.9 months.

Thirteen years of educational work had cut down the period between the discovery of the first symptom in superficial cancer and the first call on the doctor from 18 months to 14.6 months, or 20 per cent., and in cases of deep-seated cancer to nearly one-half.

These are encouraging results, and the Cancer Commission of Pennsylvania may feel justly proud of them. They show the practicability of further advance.

The following remarks, taken from the re-

port of the Pennsylvania Cancer Commission, are worthy of attention, especially because they relate to cancer of the breast and uterus. Cancer in these two localities constitutes over 40 per cent. of the total cancer mortality among women in the United States.

"Cancer of the Breast. In 1910 the physicians first consulted for cancer of the breast did not make a local examination in 3 per cent. of the cases. In 1923 failure to make an examination at the first visit was not noted once in the 227 breast cases reported. However, 10 per cent. of the doctors first consulted are chargeable with 77 per cent. of the doctor's delay. The average delay for the 10 per cent. was 25.9 months per case. The 90 per cent. of doctors were accountable for an average delay of only 0.9 month per case, and 66 per cent. of the doctors first consulted allowed no delay at all.

"Twenty-nine, or 10 per cent., of the women applied to a doctor immediately after noticing a lump in the breast, a vast improvement over 1910.

"Cancer of the Uterine Cervix. In 1910 the physicians first consulted did not make a local examination in 10 per cent. of the cases. In 1923 the figure was 7 per cent. This was an improvement, but not enough. Ten per cent. of the doctors first consulted in the cervix cases are chargeable with 51 per cent. of the delay. The average delay for this 10 per cent. was 9.5 months per case. The remaining 90 per cent. were responsible for a delay of 0.9 month per case. Fifty-seven per cent. of the doctors who were first consulted allowed no delay at all.

"Nineteen, or 8.5 per cent., of the women applied to a doctor at once after noticing the first symptoms—again a marked improvement over 1910."

THE BACKWARD TEN PER CENT.

The remarks which the Commission makes concerning the physicians who seem deserving of criticism can best be stated in the language of the report:

"The above analysis of the breast and cervix group indicates very clearly that, so far as the medical profession goes, about 10 per cent. still have a great deal to answer for. These are the men who, as Dr. H. K. Pancoast says, 'never go to medical meetings and never read the journals,' and who take no interest in the notion that if cancer is to be treated successfully, it must be treated early. Some of the statements made by these men to their patients would be laughable if it were not for the future tragedy that they imply."

Passing now from a consideration of various details of the effort to control cancer through a closer coöperation between the public and physicians, we may glance again at some of the larger aspects of this great question of cancer as it affects the human race. In doing so, we shall be particularly interested to inquire into the resources which exist throughout our country which the family doctor may want to make use of.

Are there ample hospital accommodations for the cancer sick?

Are there institutions with sufficient capacity to take care of the incurable cases?

The state of Massachusetts has recently come to realize that cancer is not only a great medical problem but a great social and economic one. A report, not so complete as might be desired, but a vigorous step forward, has just been issued by the Commonwealth upon the prevalence of cancer in Massachusetts and the inadequacy of the medical, hospital and nursing resources which are available for patients ill of this disease.

A need has been found to exist for the hospital and medical care of persons who can afford to pay something each week but not the charges commonly received by pay institutions.

The new Norfolk state hospital and the proposed clinics should do much to help the situation in Massachusetts.

In Europe the control of cancer is recognized to be a matter of proper public concern and most of the great countries have undertaken to carry out broad programs for the prevention and treatment of malignancies. In England interest centers largely in the promotion of research into the causation and cure. Not only are there well-established institutions at work in this direction, but three years ago there was undertaken the British Empire Cancer Campaign, whose project involved the collection of $5,000,000 to help pay the expenses of research and otherwise stimulate the efforts of investigators.

France has its anti-cancer centers with their special hospital provisions for diagnosis and treatment, research laboratories and provisions for the instruction of medical students. These centers are maintained under government auspices and are exercising a wide and helpful influence.

There is a national society against cancer in France and it is to its influence that the government undertaking is to be attributed.

Switzerland and Belgium have anti-cancer centers like those of France.

Germany has its general society and local associations against cancer and is well known, of course, for the research work which has been done at various places.

In Austria there is a society against cancer which was started 14 years ago as an organization to build hospitals specially for cancer patients. In spite of the straitened finances of that country the society is still in existence. It is animated by the highest motives and has many noteworthy accomplishments to its credit.

Perhaps the most progressive country with reference to anti-cancer work is Sweden.

It is time for the people of the United States to become aroused to the magnitude of the cancer scourge and take arms against it. Such measures should be adopted as will provide not only for the prevention and cure of the disease but also for the care of incurable victims.

What everyone wants, of course, is a successful medical treatment to be discovered, or better, some method of prevention which will give man the mastery over cancer which he has acquired over some other diseases.

Shall we wait for this medical cure to be invented? Must we do nothing until the causation and cure of cancer are completely worked out?

It may be a long wait. Most of the leading students of cancer are by no means sanguine that the solution of the cancer riddle will be found for generations to come, if ever.

Meanwhile what of our men and women who are suffering, and making such pitiable appeal for the help which we can not now supply?

Cancer is killing over 100,000 men and women in the United States each year.

As you walk along the street, as you look about you in the theatre or in any gathering, you may be reasonably sure that one in any ten of the grown persons upon whom your eye falls will die of cancer.

Statistics show that among men between 50 and 75 years of age, one in eight dies of cancer, and among women between 45 and 65 years one in five succumbs to this disease.

Cancer is now in fact the leading single cause of death. For if diseases of the heart, of the lungs and the kidneys seem to dispute that evil supremacy, we must remember that many of the victims owe their end to early infections and other previous disabilities.

There is no disease comparable with cancer in its prevalence, fatality and resistance to treatment. We may talk about this among ourselves and it is a wholesome thing to do so.

We are almost afraid to say it to the public. Physicians have the greatest responsibility for the control of cancer and among physicians it is the family doctor who is the Key-man.

THE CONTROL OF THE COMMUNICABLE DISEASES PREVALENT IN MASSACHUSETTS*

With a Study of the Mortality Due to Them During the Past Seventy-Five Years

BY EDWARD G. HUBER, M.D.

(Continued from page 371)

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5. Whooping Cough

There is nothing in the literature to indicate that whooping cough was recognized as a disease entity much before the sixteenth century, when Baillou described the 1578 epidemic in Paris. The London epidemic of 1658, described by Willis, was followed by a spread of the disease over the rest of the world. It reached America in 1732.

Reliable information as to morbidity is difficult to obtain, and therefore no figures are here being quoted. Luttinger made an investigation in New York City in certain districts and concluded that only 10% to 15% of cases are actually reported. Those factors which prevent efficient reporting are the following:

1. Many cases are unrecognized.
2. Many well-marked cases are not reported because the gravity of the disease is not widely recognized.
3. The case is often not seen by a physician until bronchopneumonia is present, and the nature of the original disease is masked.

Figure 38 shows the crude mortality rate for Massachusetts from 1849-1922. Until 1874 it was stationary. Ever since, there has been a slight but distinct downward trend except that in 1918 the rate was higher than it had been since 1884. The 1921 and 1922 rates seem to have returned to the trend line. Figure 39 shows that the rate for infants is much higher than for ages 1-4. As shown in figure 3, the proportionate mortality for whooping cough in infants not only is highest of all the com-

TABLE 6

Whooping Cough, Massachusetts, 1849-1922

1849-1922		
Total deaths all ages	21,451	
Deaths under 5	20,643	96.2%
Deaths 5-9	673	3.1%
Deaths over 9	135	.7%
1887-1922		
Total deaths all ages	10,880	
Deaths under 1	6,468	59.4%
Deaths 1-4	4,063	37.3%

*Published by the Committee on Public Health of the Massachusetts Medical Society.

municable diseases, but it is increasing. In addition, the female rate is constantly higher than the male, particularly at ages 1-4. This is also true of ages 5-9 as shown in figure 40, the proportionate mortality from whooping cough at ages under 1 and 1-4 is seen to have generally been between 1% and 3% but with a recent trend to an increase in the proportion

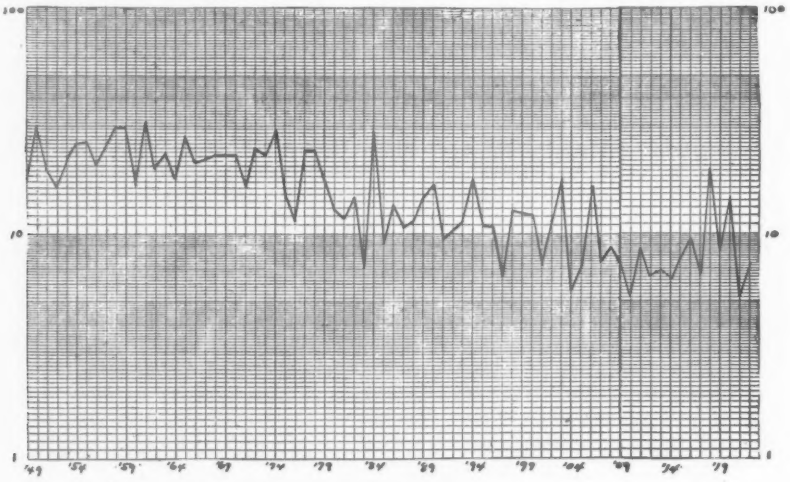

FIGURE 38
WHOOPING COUGH
MASSACHUSETTS, 1849-1922
Crude Mortality Rates per 100,000

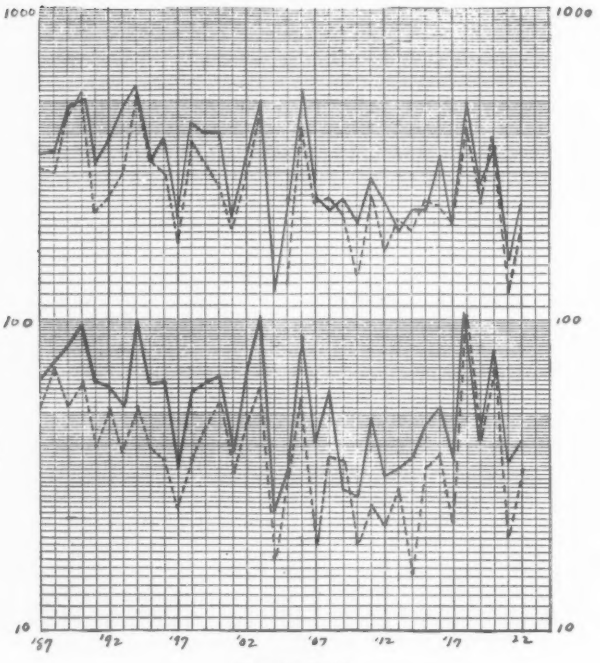

FIGURE 39
WHOOPING COUGH
MASSACHUSETTS, 1887-1922
Specific Age and Sex Mortality Rates per 100,000
———— females
---------- males
Upper curves, age under 1
Lower curves, age 2-4

although at the latter age both rates are much lower. Table 6 shows that over 96% of all reported whooping cough deaths in Massachusetts have been at ages under 5, and that 59% of all deaths have been in infants. In figure 41 for each age group but particularly the older one. Figure 42 demonstrates the fall in proportionate mortality at age under 5 from 1849 to 1910, with the succeeding increase. There has also been a slight tendency for the proportionate

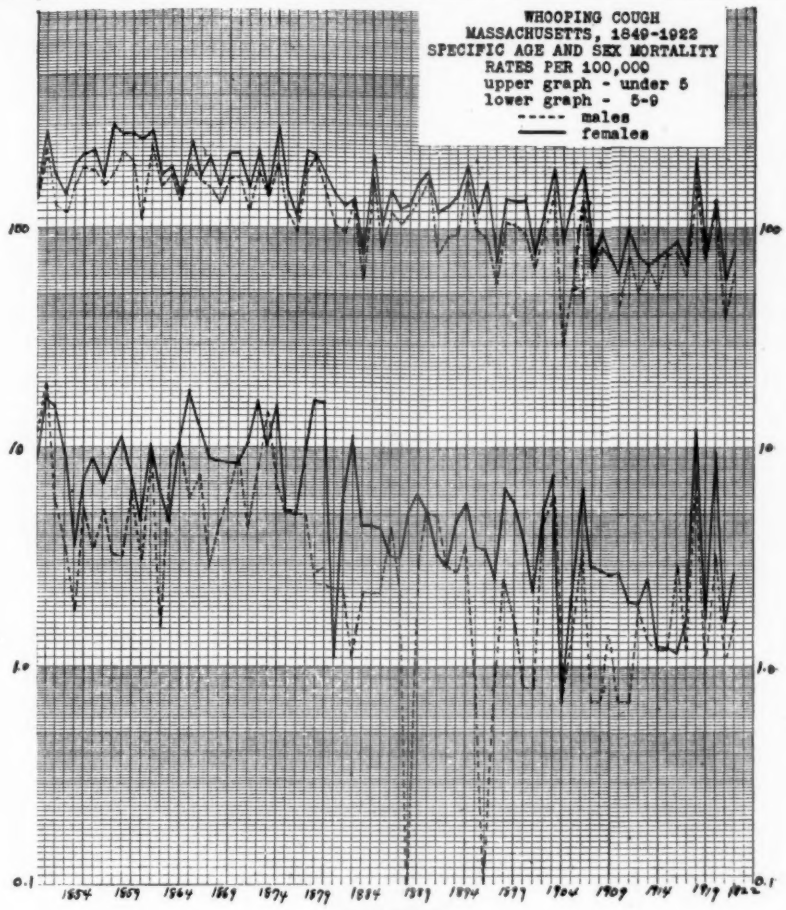

FIGURE 40

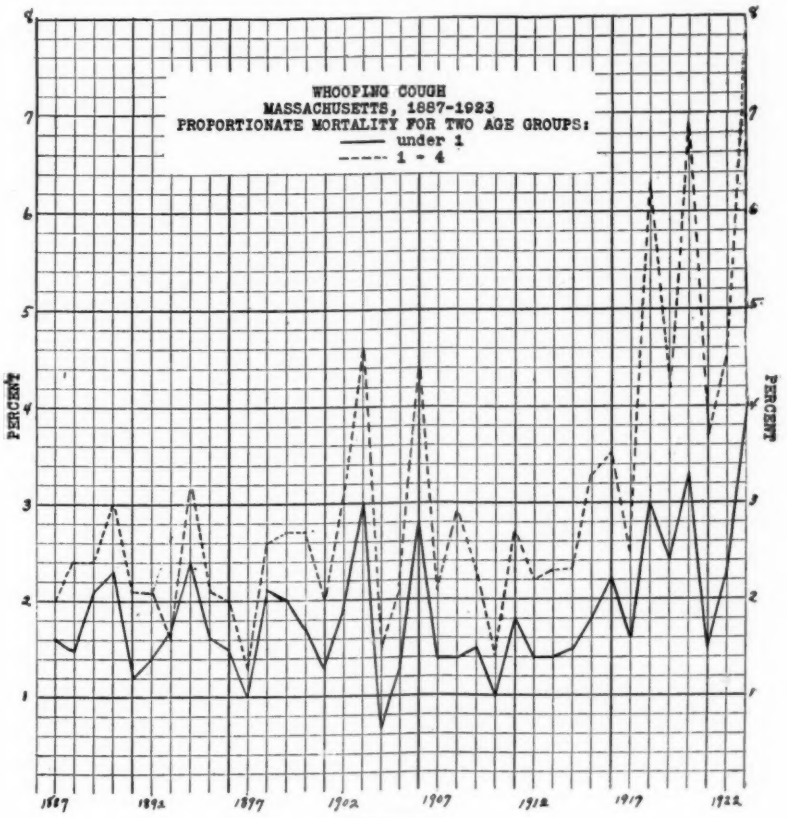

FIGURE 41

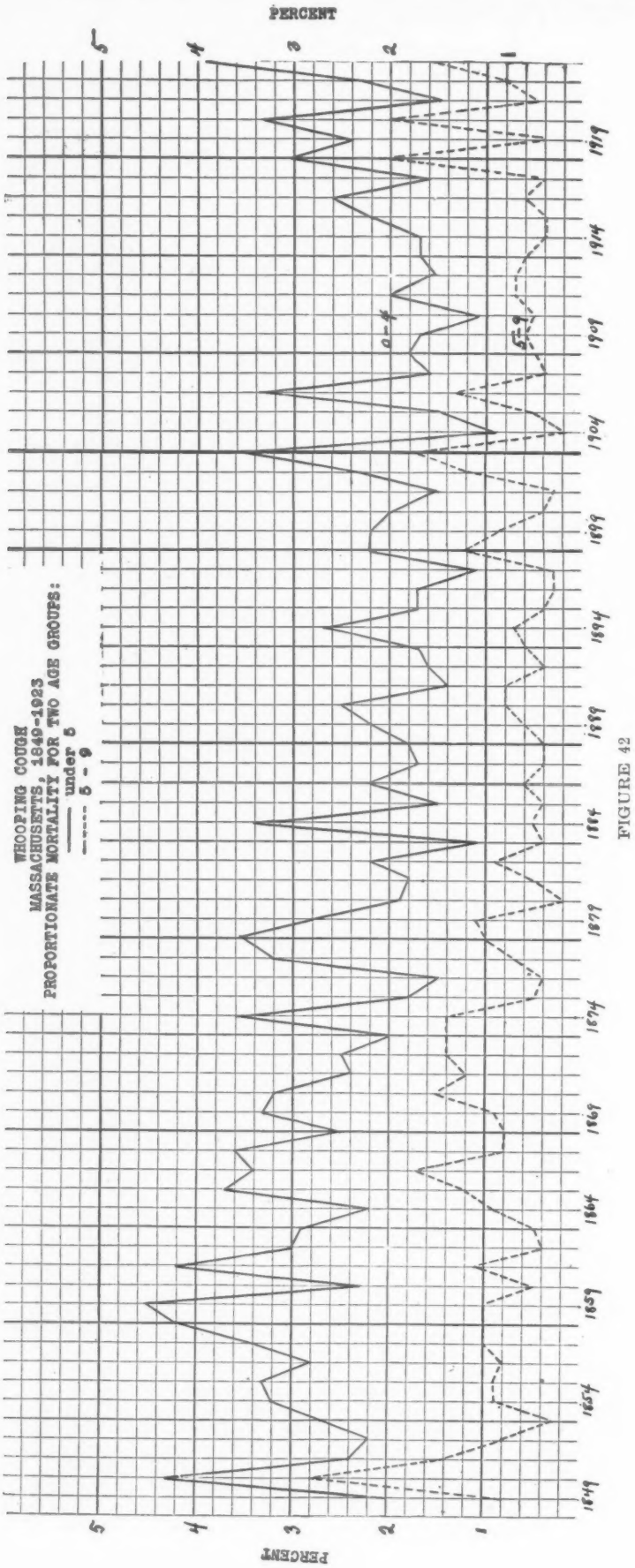
PERCENT
WHOOPING COUGH
MASSACHUSETTS, 1849-1923
PROPORTIONATE MORTALITY FOR TWO AGE GROUPS:
—— under 5
---- 5 - 9
0-4
5-9
1849
1854
1859
1864
1869
1874
1879
1884
1889
1894
1899
1904
1909
1914
1919
1
2
3
4
5
PERCENT

FIGURE 42

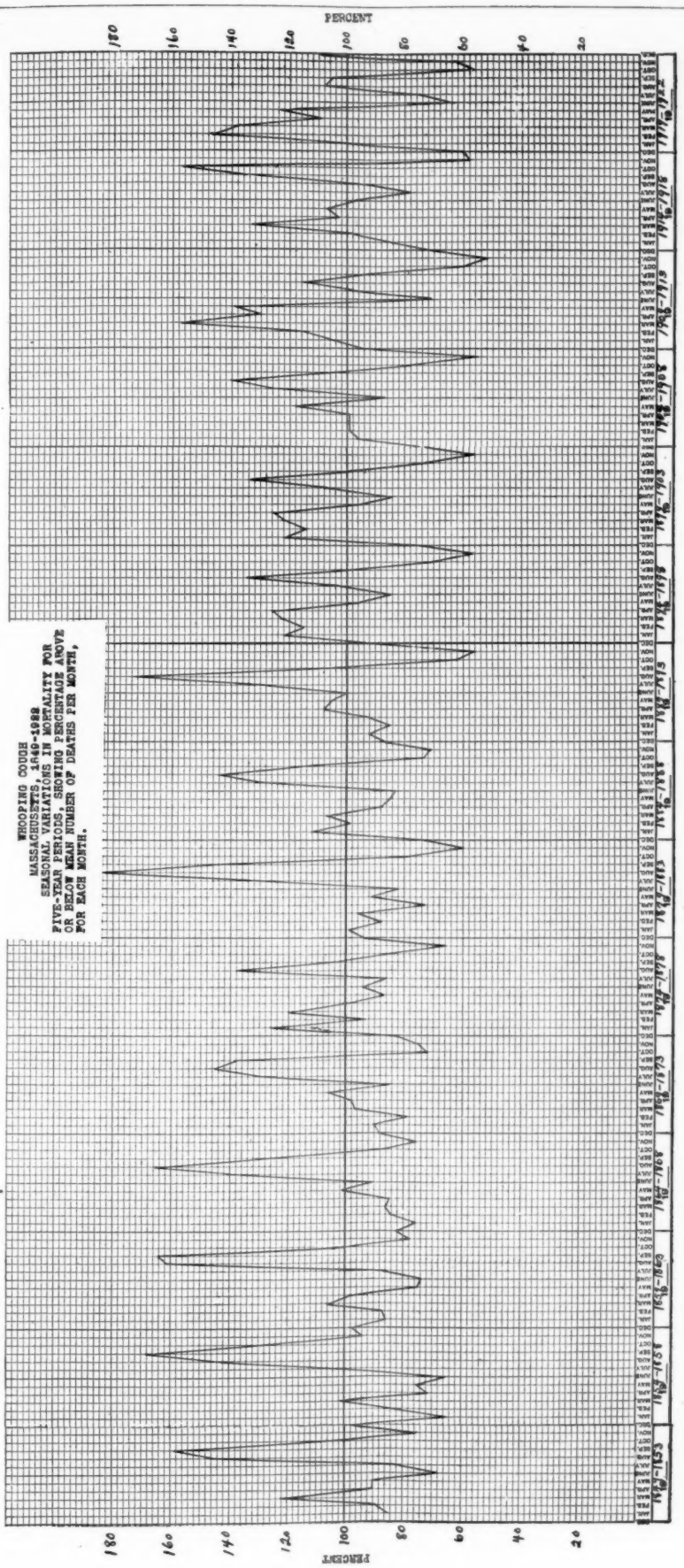
PERCENT
180
160
140
120
100
80
60
40
20
WHOOPING COUGH
MASSACHUSETTS, 1840-1928
SEASONAL VARIATIONS IN MORTALITY FOR
FIVE-YEAR PERIODS, SHOWING PERCENTAGE ABOVE
OR BELOW MEAN NUMBER OF DEATHS PER MONTH,
FOR EACH MONTH.
1840-1844
1845-1849
1850-1854
1855-1859
1860-1864
1865-1869
1870-1874
1875-1879
1880-1884
1885-1889
1890-1894
1895-1899
1900-1904
1905-1909
1910-1914
1915-1919
1920-1924
1925-1928

FIGURE 43

mortality for age group 5-9 to increase since 1917, although this percentage had generally been less than 1% since 1850. The seasonal variation in deaths (figure 43) is very irregular. Until 1893 the peak was always a sharp one, in August or September in every quinquennium except 1874-1878. After 1893 and also during 1874-1878 there were two peaks annually, one in the spring and the other in the late summer. In five of these quinquennia the spring peak actually was higher, and markedly so, and in three they were almost equal. The spring peak occurred from January to March, and the corresponding late summer peak was almost always in August. The general impression is that the mortality from whooping cough has changed from late summer to early spring.

Whooping cough is prevalent everywhere, in all climates, no matter what the race. As a general rule epidemics are more extensive the greater the latitude, although Jamaica suffered more from epidemics over a period of years than northern European countries. On the other hand case fatality seems to be greater in climates where respiratory diseases are more prevalent, since bronchopneumonia is so often a fatal complication.

As in all the communicable diseases there are typical and atypical cases. The proportionate number of atypical cases is of course not known, but it is thought to be very high. The older the patient, the more atypical the cough, which is the clinical feature on which the diagnosis is based. These cases are as infectious as the classical ones. Schwenkenbecher and Neurath think that pertussis is much more prevalent among adults than is generally thought owing to the fact that the spasmodic type of cough is either absent or tends to be repressed by will power. The former describes an epidemic of non-characteristic cases among five adults in adjacent offices. The families of these men were subsequently infected by them. Philips reports two cases where the disease was contracted at birth from an obstetric nurse who had a cough the true nature of which was unsuspected. He saw in one year three families where six cases were contracted from nurses who had "ordinary colds."

The case fatality, being dependent on correct information as to morbidity, is uncertain. Almost all who attempt to give figures say it is from 4% to 6%. Luttinger thinks it less than 1%, which seems to be nearer the true figure. The case fatality is certainly greater the younger the patient, but until reporting is more accurate, the correct rates will not be known.

Bacillus pertussis is universally recognized as the etiologic factor. It is closely related, morphologically at least, to B. influenzae and to B. bronchisepticus. The latter causes a canine distemper in which Rhea has described conditions like those first observed by Mallory which caused the latter to suggest that inasmuch as the bacilli grew in clumps between the epithelial cilia in trachea and bronchi, they produced the cough mechanically. The morphologic relation to B. bronchisepticus is interesting from the standpoint of the transmission of the disease. Various investigators have described different serologic groups and strains of B. pertussis. This fact is of importance in the preparation of vaccines, which should therefore be autogenous or polyvalent.

The diagnosis of whooping cough by means of bacteriological examination of the sputum has reached its greatest practical value in Denmark, but it is not thought to be practicable for this state. The patient coughs onto the medium in a special aluminum box, which is then quickly sent to the laboratory. During the catarrhal stage about 75% of cases of pertussis are positive. This percentage decreases in succeeding weeks until, after the fourth week, less than 10% are positive.

The period of incubation is not known owing to the ever-present doubt as to the exact date of onset of the disease, but it is thought to be between two and ten days. If, after exposure, the disease has not appeared in fourteen days, the danger of contracting it may be considered to have passed.

Whooping cough is transmitted by means of the sputum. The very nature of the chief symptom, the spasmodic cough, is such as to secure by means of its force, the maximum distribution of droplets of sputum—often to a distance of four or five feet, so that actual contact is not the chief factor as in other diseases. The bacillus is short-lived, and is therefore not often transmitted by a third person or by fomites unless the intervening time has been very short.

Pertussis is most contagious, unfortunately, in the premonitory period, when the clinical diagnosis is most difficult. The degree of contagiousness decreases as the disease progresses, in direct relation to the prevalence of B. pertussis in the sputum as shown by bacteriological examinations. After two weeks of the spasmodic cough the bacteria have largely disappeared. Weill states he observed 104 children living in closest contact with 26 others in the late spasmodic stage. None of them contracted the disease at that time although some of them did in after years. Sajet and Gelderen made a house to house investigation and found that in 106 infected families in which there were 247 susceptible children who has been exposed, 114 or 46.2% contracted the disease.

The control of whooping cough is almost impossible at the present time, for the following reasons:

1. Prevalence of mild and atypical cases which are recognized with difficulty clinically, even by physicians.

2. Failure to call a physician, even for the typical cases.
3. Coincidence of the period of greatest contagion with that when diagnosis is most difficult.
4. Prevalence of unknown healthy carriers.
5. Lack of necessity of confining patient to bed.

Certain measures can be taken however which will lower the disease incidence somewhat, and the mortality considerably more. Since the greater proportion, by far, of the mortality, is in children under five years of age it seems more rational to isolate these children than those in the family who have the disease. However, isolation of the sick should be practiced, in order to control the contacts as much as possible even if many have already been exposed.

There is considerable variance in the different states in the efforts that are made to control the disease. It is a notifiable disease in most of the states but less than half of them require isolation of cases. Some states permit non-immune members of a family where there is whooping cough to go to school, and in two states there are no legal restrictions to prevent infected persons attending school. It is evident that standard measures are desirable. In the first place, the disease should be everywhere a reportable one. Even if the figures so obtained do not include the atypical cases, they will be of some assistance. The reporting of a case enables the health officer to give that family information as to the prevention of transmission of the disease and especially how to protect the infants from so grave a disease.

The patient should be isolated for a period of one week from the time of the onset of the whoop, or if the characteristic cough is absent, two weeks from the onset of catarrhal symptoms. During that time and until release from quarantine the sputum should be caught on paper napkins, put into paper sacks, and burned. Separate dishes should be provided and all dishes in the household should be boiled after each use. Vomitus should be chemically disinfected. Dogs and cats should be kept away from the patient during the entire period of his disease. Experiments have shown that these animals may be infected with B. pertussis, and the relation of distemper to whooping cough may possibly be a close one. The house should be placarded so that those who so desire may avoid exposure. After the period of isolation, when fresh air is a necessity for convalescence, the patient may be allowed to go about out of doors if accompanied by a guardian. The latter should be responsible for the collection of the sputum in paper, to be burned, and for keeping the patient away from other children. The wearing of a distinctive arm band has been somewhat ridiculed yet it is the only practicable way to exclude infected children from public conveyances and the like. No mother likes to have her child unknowingly exposed to whooping cough even though she may shrink from having it wear a band when necessary to protect others. Those who wish to avoid ambulant cases of whooping cough have no other way of recognizing a case except by the characteristic whoop—and then it may be too late. The arm band should be worn until five days after the last paroxysm. It is true that the paroxysmal stage is not so infectious as was once thought. Positive bacterial findings are less and less common as the disease progresses, but there is some danger, even if slight, of transmitting the disease to others, and since there is no more inconvenience involved than the wearing of a band, the effort seems worth while.

The other children in the family should be kept out of school until two weeks after the last exposure unless the health department records show that the child had whooping cough previously or that preventive vaccination had been given soon after the exposure, and there are no catarrhal symptoms. Both these exceptions react to help the health department's campaign, for parents do not like to have their children kept out of school. They will be willing to coöperate in reporting cases and will be more favorably disposed toward prophylactic vaccinations, since such children suffer no interruptions in school attendance. It is very desirable and often possible to send the other children to relatives to live, to avoid further exposure. This is most advantageous for children under 5 years of age, but infants generally must stay with the mother who frequently must nurse the patient also. In this event, hospitalization of the patient is almost essential although the probability is that transmission of the infection has already occurred. The vaccination of the infant is imperative. Children kept out of school because of exposure should be under the observation of the health department, and not merely sent away. When catarrhal symptoms appear in a school-child in the presence of an epidemic, the child should be isolated and treated as a case of pertussis at once. In fact, an excellent rule to follow at any time is for the teacher to inspect her pupils each morning and to send home all those who have any catarrhal symptoms, notifying the health department at the same time.

Treatment of whooping cough in clinics and in dispensaries is mentioned only to be condemned. This method furnishes an excellent way to spread the disease. Even if the clinics are for pertussis only, the fellow-travellers on the public conveyances would suffer.

The detection of healthy carriers can be accomplished only by tracing the infections which follow them. The diagnosis of mild, or of atypical cases, and the earlier diagnosis of typical cases is possible with the aid of a bacteriological laboratory only. This is still impracticable.

Vaccination has already been mentioned.

There is every indication that it is of value as a prophylactic if polyvalent, fairly fresh vaccine is given early in the period of incubation and in doses of a half billion to two or three billion on alternate days for three or four doses. Miller immunized ninety children who had been exposed. Only two contracted the disease and it was found that they had been in the catarrhal stage when they reecived the first dose of vaccine. Serotherapy has also been used with apparent success but vaccines are more practicable for obvious reasons. Mixed serum from cases of pertussis in the fourth week of the disease was shown by Debré to have prophylactic but not curative value. Intradermal diagnostic tests have not yet met with success.

The most important preventive measure is the education of both the laity and the medical profession that the disease is grave, and that their full coöperation is needed before control can be obtained. Until this has been accomplished very little headway will be made. All health agencies—national, state, district, county, municipal, and private, should assist. The most important knowledge to spread is that mothers should keep their young children away from other children who have catarrhal symptoms. The prevalent idea that whooping cough is inevitable and that the sooner it is over with the better, must be actively combatted. Mothers should isolate their children as soon as they look sick; if this could be faithfully carried out the greatest step in the control of communicable diseases will have been taken.

Summary of Preventive Measures

1. Reporting of all known cases, by the family if no physician is called.
2. Isolation of all known cases for one week after onset of characteristic cough. Wearing of a distinctive arm band, and avoidance of other children and of public conveyances, etc., until five days after the last whoop.
3. Exclusion from school and public gatherings, of non-immune children, for fourteen days after last exposure.
4. Immunization by vaccine of all exposed children and sepecially those under the age of five, early in the period of incubation.
5. Education of the public as to:
   (a) Necessity of reporting cases.
   (b) Gravity of the disease under five years of age.
   (c) Value of vaccination.
   (d) Necessity of keeping young children away from all other children who have catarrhal symptoms.
   (e) Necessity of immediate isolation of any child who has catarrhal symptoms until the disease is known to be non-contagious.

(To be continued)

FIGURES

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DR. EDGAR O. CROSSMAN WILL RETIRE FROM HIS PRESENT POSITION AND WILL SUPERINTEND THE VETERANS' HOSPITAL, WEST ROXBURY, MASS.

Dr. Edgar O. Crossman of New Hampshire is about to retire as Medical Director of the United States Veterans' Bureau. After August 7th he will superintend the West Roxbury, Mass., Veterans' Bureau Hospital for mental and nervous diseases, at the same time he will supervise, from a medical standpoint, the construction of the Northport, Long Island and the Bedford, Mass., Veterans' Bureau Hospitals for nervous and mental diseases.

As medical director of the United States Veterans' Bureau, Dr. Crossman has had supervision over a department numbering twenty-five thousand persons and in his customary manner he performed his duties with great efficiency and credit, eliminating to a large extent obstructive red-tape and so-termed political manipulation. He has reflected great credit upon himself, the state of New Hampshire and his country. Dr. Crossman's phenomenal success as the Medical Director of the Veterans' Bureau came with gratification but with no particular surprise to his many friends, for Dr. Crossman's life has been characterized by courage, perseverance, open-mindedness and good judgment.

Dr. Crossman was born in Windsor County, Vt. He received his professional education at the New Hampshire State University and the University of Vermont. He then did Sanitarium work for eleven years, serving at Clifton Springs and at sanitariums in Philadelphia.

Dr. Crossman has been chairman of the board of trustees of the New Hampshire State Hospital at Concord, N. H., and president of the New Hampshire State Medical Society. He is a fellow of the American Association of Psychiatry, honorary member of the American Physiotherapy Society as well as a member of the several local, state and national medical associations. Dr. Crossman served in the Medical Corps of the United States Army during the World War and is now Lieutenant Colonel of the United States Medical Reserve Corps.

Case Records
of the
Massachusetts General Hospital

ANTE-MORTEM AND POST-MORTEM RECORDS AS USED IN WEEKLY CLINICO-PATHOLOGICAL EXERCISES

EDITED BY
RICHARD C. CABOT, M.D., AND HUGH CABOT, M.D.
F. M. PAINTER, A.B., ASSISTANT EDITOR

CASE 12341

AN OBSCURE FEVER

MEDICAL DEPARTMENT

A married Canadian waitress twenty-three years old entered February 27 for study. The chief complaints were nervousness, fever and amenorrhea. Her father died at seventy-five of shock. One sister died of tuberculosis; the patient was exposed in childhood. Another sister died of spinal meningitis after seven days of coma. In childhood the patient had varicella, two attacks of measles, and a period of several weeks when she vomited frequently immediately after meals and had a fat face and large abdomen but thin legs. After regulation of diet by a doctor and a course of Scott's emulsion of cod liver oil the vomiting and abdominal enlargement disappeared. Since childhood her joints and muscles had been stiff before bad weather. She had a mild attack of influenza during an epidemic, a very doubtful case of smallpox, and four attacks of tonsillitis, one rather severe, keeping her in bed a week. While working as a ward maid in an insane hospital her arm was bitten by a syphilitic patient. The wound quickly healed without any sequelae that she knew. She was easily excitable, and on excitement had forceful and rapid beating of the heart. She had been married three years. For over a year she had had an almost continuous scanty white vaginal discharge. For a month the winter before admission she had some cough and tickling of the throat on lying down.

She gave the history of her present illness in a way that indicated to the history taker either nervousness or an unwillingness to give important information. Apparently she felt well until December 1, three months ago, when she spent the night with a sister, sleeping in a narrow bed with all the windows open. Next morning she awoke feeling very cold and with a slight sore throat. That day her sister noticed a spot on the patient's right cheek near the angle of the mouth. A rash quickly spread, involving her legs last. This rash never entirely disappeared, although on waking in the morning it was considerably less than during the day. The week following the onset she had mild sore throat, constipation, and did not feel quite well. A week after the first symptoms she awoke one morning with marked soreness on motion in all the joints; no redness, swelling or marked tenderness. Her throat was worse and she felt feverish. She had diarrhea for four days, vomited a little bile-stained mucus three or four times, and had some dizziness and headache. Her joints continued to be sore, but were less stiff until two weeks before admission, when there was a temporary exacerbation of stiffness and she felt more feverish. Since the first week of the illness she had been in bed practically all the time. From December 15 to February 27 she was in a hospital. Besides the joint and throat symptoms she was feverish, weak, nervous and depressed. Her bowels acted normally.

A physician who attended her at that hospital gives the following report: Until the past few days her general wellbeing was quite remarkable in view of the continued temperature and stay in bed. She had gradual loss of weight. For the first ten days in the hospital she had moderate diarrhea, and for the first few days occasional vomiting. During the first three weeks she had some morning cough with a little whitish sputum and once a clot of blood, thought not to come from the chest. Off and on until the present time she had complained of slight pain in different joints and muscles, never really troublesome. At intervals she complained of sore throat. The tonsils however had seemed absolutely normal. Recently there had been slight redness in the anterior pillars on the right. During the two months the temperature ranged from 96.7° to 104.7°, with two periods of a week or ten days when it was normal. When she was allowed to get up gradually during these periods the temperature again rose. The pulse had been constantly high even when the temperature was normal. Nervousness may have been a factor. A rash had been present off and on until the past few weeks, only on the body and extremities, often practically absent many days at a time. Recently it had been on the face and the palms of the hands. Its character had not changed. There never had been petechiae or evidence of emboli in the skin, or hemorrhages in the conjunctivae or mucous membranes. The hemoglobin had never gone below sixty-five per cent. The heart sounds had been rapid and rather weak, with some tic-tac quality. A soft systolic murmur had been present from the first. No significant change in sounds or murmurs had been observed. Small cervical glands were palpable at times, apparently varying in size. There were only very questionable lung signs. Recently it had seemed that the dullness at the right apex had been more evident and extended down almost to the lower border of the scapula. Bronchovesicular breathing at present seemed to be lower than formerly and quite different on the right from what it was on the left. There had been no râles at any time. The abdomen

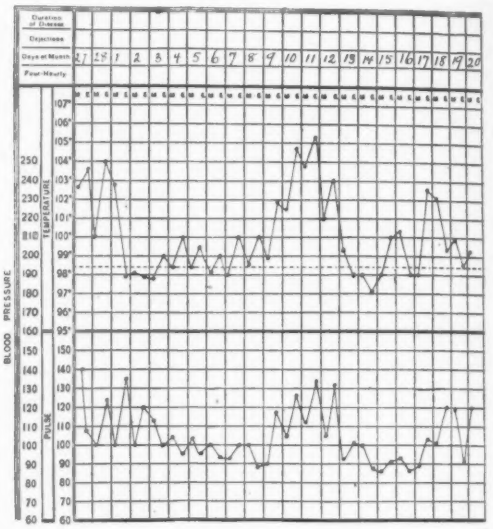
had been normal throughout. Portable X-rays of the chest December 31 showed a high diaphragm, the heart normal in outline, quite a considerable increased mottling out into the upper portion of both lobes and into the apices, no thickening of the apical caps. The appearance was that of a congestive inflammatory process somewhat like a bronchopneumonia, rather deep seated. The patient had been kept in bed constantly except as previously mentioned, and had had liquid and soft solid diet, forced fluids, sodium salicylate, aspirin off and on; never vigorous treatment with this; Blaud's pills off and on, never for long periods. She had not menstruated since December 13. The intermenstrual discharge had persisted. She was transferred to the Massachusetts General Hospital with no positive diagnosis.

Examination showed a rather ill, pale, worn woman not suffering acutely. There was a papulo-erythematous blotchy eruption on the back, chest, arms and face. A skin consultant reported, "Toxic erythema, cause to be determined." The heart was very rapid. The apex impulse was felt in the fifth interspace. The left border of dullness was 8½ centimeters from the midline, 1 centimeter outside the midclavicular line. There was no other enlargement to percussion. There were no murmurs. The blood pressure was 120/80. Electrocardiogram showed normal rhythm, rate 105. There was slight tenderness of the muscles and joints. Vaginal examination showed very slight yellowish discharge. There were palpable non-tender cervical and right supraclavicular glands. Examination was otherwise negative.

The urine was 30 to 90 ounces in amount, specific gravity 1.006 to 1.030, a very slight trace of sugar at one of nine examinations, no albumin. The sediment showed rare leucocytes at five examinations, occasional to many at three others, and was loaded at another. Blood examination showed 26,500 to 8,200 to 35,320 leucocytes, 85 per cent. polynuclears, hemoglobin 75 per cent., 3,856,000 to 3,128,000 reds, slight to moderate achromia and anisocytosis, slight poikilocytosis in one of two smears, platelets normal in one, increased in the other; no endothelial phagocytes in three examinations. Blood cultures February 28 showed no growth, March 7 I bacillus epidermis communis, II no growth; March 11 I Gram-positive spore-bearing bacilli, II staphylococcus albus. Wassermann negative. X-ray showed the lung fields of normal brilliancy throughout; no increase in the mediastinal shadow. The sinuses were of normal radiance. Large films of the jaw showed no gross evidence of foci. There was considerable motion present.

The orders were for a soft solid diet with forced fluids, and aspirin and sodium salicylate (see below). Zinc oxide wash* was applied to the rash p. r. n.

The temperature and pulse are shown in the chart. The respiration was normal except for



slight elevation at entrance (31) and before death (35).

The staff was cautious in attributing the drop in temperature March 1 to salicylates. By March 8 the leucocytosis was subsiding and the joints were free from pain. There was tenderness of the toes. March 10 in spite of salicylates the temperature again rose and the leucocytosis increased. Salicylates by rectum were expelled March 10 and 11. The temperature fell rapidly on the administration of salicylates and rose slightly after they were reduced to 30 grains twice a day. March 19 the patient was extremely weak, with a tendency to be irrational. The respiration was Cheyne-Stokes and she sweat profusely. The morning of March 20 she died.

SALICYLATE THERAPY

February 28: Aspirin 50 grains with sodium bicarbonate 30 grains at 11:15 p. m. and repeat twice tonight when awake.

March 1: Aspirin 50 grains in course of a. m.; aspirin 20 grains with sodium bicarbonate 20 grains every two hours until toxicity; flannel night clothes.

March 2: Aspirin 10 grains with sodium bicarbonate 10 grains twice during the night; sodium salicylate 40 grains by rectum in three ounces water at 11:40 a. m.; sodium salicylate 30 grains in three ounces water by rectum at 8 p. m.

March 3: Sodium salicylate 30 grains in three ounces water by rectum before noon; repeat to-night before midnight if no toxic symptoms develop.

March 4: Sodium salicylate 40 grains in three

*Zinc oxide 3 ii, calamin 3 i, glycerin 3 ii, phenol minims xx, water to make ℥ viii.

ounces water at 7 a. m. and 6 p. m.; aspirin 15 grains crushed and given in one half ounce milk of magnesia.

March 6: Sodium salicylate 40 grains in three ounces water at 11 a. m. and 8 p. m.

March 7: Sodium salicylate 50 grains by rectum at 9 a. m. and 9 p. m.; aspirin 15 grains in capsule, one at 2 p. m.

March 8: No medication.

March 9: Sodium salicylate 50 grains by rectum at 7 a. m. and 9 p. m.; aspirin in capsules 30 grains, two capsules at 11:30 a. m. with noon meal.

March 10: Sodium salicylate 50 grains in three ounces water by rectum at 8 a. m.; aspirin 30 grains at noon; sodium salicylate 70 grains in three ounces water at 6:45 p. m.

March 11: Sodium salicylate 70 grains by rectum at 7 p. m. and 12 midnight.

March 12: Sodium salicylate 80 grains by rectum at 8;30 a. m. and 3 p. m. if no tinnitus; aspirin in capsules 30 grains at 8:15 and 9:15.

March 13: Aspirin 15 grains in capsules at 10, 2, 6 and 10; sodium salicylate 70 grains at 9 a. m. and 8 p. m.

March 14: Sodium salicylate 30 grains by rectum at 4 p. m. and when awake between 11 p. m. and 2 a. m.

March 15: Sodium salicylate 30 grains at 10:30 a. m. and 10 p. m.

March 16: Sodium salicylate 70 grains by rectum at 10 a. m. and 9 p. m.; aspirin capsules 15 grains at 11, 3 and 6.

March 17: Sodium salicylate 50 grains by rectum at 10 a. m. and 9 p. m.; aspirin 15 grains in capsules at 11 a. m., 3 p. m. and 6 p. m.

March 18: Sodium salicylate 80 grains at 10:30 a. m. and 9 p. m.; aspirin 15 grains in capsules at 10, 2 and 6.

Discussion

BY RICHARD C. CABOT, M.D.

NOTES ON THE HISTORY

1. This is the correct way to put this family history. Because if we do not put into the record whether or not the patient was exposed, the tuberculosis makes no difference.

2. They were thinking of abdominal tuberculosis here, but I do not see that we have any reason to do more than make a vague guess at it.

3. This patient had a great variety of infections and possible infections, but nothing that helps me to forecast the future.

4. It looks as though she had some sort of infection at the onset of the present illness.

5. She has been three months in bed, but some tonsillitis and arthritis is all we have so far.

6. This is a state of things I have often commented on in relation to acute endocarditis,—general well being.

They are quite dubious as to whether she really had endocarditis or whether it was all nervousness. I do not believe nervousness ever causes fever. We say it sometimes because we cannot think of anything else to say, but I do not believe it. They are going over every organ so far as they can, but without any result. They are thinking of tuberculosis and of sepsis just as we are.

I may repeat here an observation I have found useful. I went over the records of cases of fever lasting for two weeks, with different diagnoses, but which in the end we knew. Of these ninety-four per cent. came under one of three causes: typhoid fever, sepsis, including heart sepsis, and tuberculosis. Those are the three causes of most obscure long fevers. Here is an obscure long fever, and I am thinking of these three causes, and trying to rule out two.

7. The right apex is the dubious apex anyway, and we cannot be sure of trouble there unless we have more than they have told us yet. These signs are the most difficult to interpret. If the findings were at the left apex we should say disease in that lung, but when they are at the top of the right lung and we have no râles we have to suspend judgment.

8. The diaphragm is high, presumably on both sides.

9. The X-ray man is very careful not to say tuberculosis, and I think it is clear that he does not think it is tuberculosis. There is such a thing as a chronic bronchopneumonia. It is so rare that it did not come into my thousand cases. But there is such a thing as non-tuberculous chronic bronchopneumonia which will cause fever for weeks.

NOTES ON THE PHYSICAL EXAMINATION

1. She had some red spots on the skin. That is all we know.

2. The X-ray says the heart is normal. I will bet on the X-ray rather than on one centimeter of percussion, thinking as little as I do of cardiac percussion.

3. A blood pressure of 110/48 three days before death suggests more pulse pressure than we should have with a normal heart. It makes us wonder about aortic regurgitation and about hyperthyroidism.

4. Physical examination is negative, and I will venture to say nobody has made a diagnosis yet.

5. There is a good swing in the gravity of the urine, a good power of concentration, so probably no nephritis. Sugar once out of nine examinations is nothing. We do not know whether these were catheter specimens, so the leucocytes are of no significance so far.

6. If anybody had been saying, as he might have been, "This is all nerves", there is one fact which makes us perfectly sure that it is not,—viz., anemia. People are always saying

"She was anemic and neurasthenic". Neurasthenia is as common as any disease known; anemia is a rare disease. If a person says "anemic and neurasthenic" I know he has not examined the blood. If there is anemia there is organic disease every time. So in this case, even if we did not know that this was a necropsied case, we should have known there was something going on because of so much fever. But if we had had any doubt this anemia would have settled it.

7. A PHYSICIAN: How about a person losing blood from hemorrhoids?

DR. CABOT: We have to take account of the amount of blood. If we think there has been quite a lot of blood lost then we may think the anemia due to that. But we have to assume that they have watched that here, and that that was not so.

8. Endothelial phagocytes are things we see especially in acute endocarditis, and they were wondering, as we are wondering, has this patient acute endocarditis?

9. Staphylococcus albus is negligible on the chances. With two flasks, one with a wild bacillus and the other staphylococcus albus, the chance is that there is no infection.

10. At the end of the history we have all the salicylate therapy so that we can see the relation of that to the periods of fever. I think the staff were wise in their caution.

11. With tenderness of the toes we think of endocarditis. But we do not know yet, I think, how many other diseases besides endocarditis may have tender toes.

12. In the end we are about as wise as in the beginning. I know that this patient has anemia and has had fever, and that is all I know. The chart is certainly a remarkable chart, but it does not tell me anything in particular as to what is the matter.

13. A PHYSICIAN: Did she have a Widal?

DR. CABOT: I do not believe it was done. With just this temperature I do not believe we should expect a Widal.

MISS PAINTER: There is none recorded.

DR. CABOT: I think it should have been done. I do not think it would have shown anything.

14. A PHYSICIAN: With such daily fluctuation in temperature and pulse, don't you think that would be against typhoid fever?

DR. CABOT: No, I don't think so.

15. A PHYSICIAN: The leucocytosis is against typhoid.

DR. CABOT: Absolutely. We cannot have this leucocytosis with typhoid unless we have some other disease too.

16. DR. RICHARDSON: Were there any records of throat examination?

DR. CABOT: At the beginning they found nothing; none afterward.

DIFFERENTIAL DIAGNOSIS

Let us take my three common fevers: typhoid, tuberculosis, sepsis. I should say this cannot be typhoid because of the leucocytosis as well as because of other facts. I do not see how it can be tuberculosis. I do not see where we can put the tuberculosis, or how she could have died with no more tuberculosis than this. I do not think it can be miliary tuberculosis. They had a good look at her chest. She never had any brain symptoms to speak of. If it is one of the classical three, I think it is sepsis.

A PHYSICIAN: Could it be syphilis?

DR. CABOT: Syphilis could cause a fever. The Wassermann is negative. That does not rule it out, of course. The difficulty is to see what caused death. It is perfectly true that there can be a long syphilitic fever, but I never knew anyone to die with it. We could have as much fever as that in the eruptive stage of syphilis. There was a skin eruption here, but the skin expert said it was not syphilis.

Malignant disease of the liver and of certain other internal organs gives a queer fever. Is there any possibility of that here? I don't think there is any chance of its being malignant disease of the liver. I believe malignant disease of the liver that causes death always enlarges the liver. They had a good chance to feel that and did not get anything.

A PHYSICIAN: Did the fever, chills, and sweating suggest liver abscess?

DR. CABOT: I should not say that, because we can get them with so many other diseases. I do not see that we have any good reason to think of liver abscess as the form of sepsis which might cause this death. So far as we know she has lived here. There is no history of her being anywhere where she could have got amebic infection, which is the only common cause of liver abscess. There is no history of gall-stones or biliary sepsis. It is always a good thing to think of biliary sepsis in obscure fevers. I recall a case of chills and fever and nothing to show for it which I examined again and again and could not make a diagnosis, which later showed up as biliary sepsis. Could this be biliary sepsis? I should say so except for the fact that she died. One cannot die of it without quite a good deal more than this patient showed. If we were all around the bedside I should say we had to consider it. But with the very important fact that we know she died, I think we have to rule that out.

A PHYSICIAN: Couldn't we say this is general sepsis?

DR. CABOT: Quite right. She might have had a general septicemia and the blood culture being negative does not rule that out. I have often tried to bring that out by using the metaphor of fishing. We throw a fly into the stream. We take a little blood at one moment from one part of the body. There may have been any quantity

of organisms in the body at that time or any other time when we were not there. It has been shown again and again that we can get a positive culture when a patient is having a chill and not at any other time. We are dealing not only with the uncertainties of small sampling but with the element of time. Positive cultures with a good man may be a basis of diagnosis, but negative blood cultures do not rule it out.

A PHYSICIAN: Acute endocarditis?

DR. CABOT: Acute endocarditis I think must be considered. I cannot rule it out. It seems to me as probable as anything I can think of.

This X-ray is not a seven-foot plate, so that we cannot tell anything about the size of the heart. I do not know much about X-ray, but I certainly never would make a diagnosis of anything in those lungs. Dr. Holmes said there was no increase of mediastinal shadow. It does not include the heart, but it is important in regard to abscess, Hodgkin's disease or syphilis up there. This plate was taken on March 17, three days before death. The other plates are of the skull in relation to possible septic foci. They are said to be negative.

Let us review this case. She has a long irregular fever. She has anemia, unaccounted for. She has a skin rash that we do not know the cause of, perhaps a salicylate rash.

Let us study the locus of infection by exclusion. I think we can exclude the kidney. I think we can exclude the lungs. I think we can exclude the gastro-intestinal tract. I think we can exclude the nervous system. I do not believe that anything in the bones or joints was the cause of death, though I think it is quite possible that there was something in the joints. I think we can exclude the pancreas, the spleen, the suprarenals, liver, thyroid.

A PHYSICIAN: Pyelitis?

DR. CABOT: It can give many of these symptoms, but it cannot cause death.

A PHYSICIAN: Septicemia resulting from that focal infection could.

DR. CABOT: Yes. But then we should have other evidence. Septicemia I think myself is the most probable cause. Colon bacillus septicemia accompanying pyelitis has caused death and is a real thing. But they should have cultivated the bacillus coli, and they did not. Ordinarily if there are colon bacilli in the blood there are a good many. I do not believe it was that.

In discussions over diagnosis here Dr. Maurice H. Richardson used to say, "I will take the field," i. e., the diagnosis is something that no one has thought of. That is my guess. But if anyone says, What do you think of? I have to say, Sepsis. I cannot think of anything better than sepsis. Where shall we locate it? I should say the heart. If sepsis is found I think it will be found in the heart. My guess is that nothing will be found that we have thought of, and that something we have not thought of will be found. But I cannot make any better guess than the heart.

A PHYSICIAN: Is the right diaphragm normal?

DR. CABOT: I should say so. If it turns out to be wrong I shall stand corrected.

A PHYSICIAN: How often does a case come to necropsy when they are not able to find at necropsy a satisfactory result?

DR. CABOT: I should say about once in one thousand cases. We put them down as "Cause unknown."

DR. RICHARDSON: That is about right. But to be honest I think they come oftener than that.

CLINICAL DIAGNOSIS (FROM HOSPITAL RECORD)

None made.
Sepsis?

DR. RICHARD C. CABOT'S DIAGNOSIS

General sepsis.
Acute endocarditis (?)

ANATOMICAL DIAGNOSIS

1. *Primary fatal lesion*

Septicemia, streptococcus.

2. *Secondary or terminal lesions*

Empyema, right.
Purulent pleuritis, left.
Purulent pericarditis.
Soft hyperplastic spleen.

3. *Historical landmarks*

Obsolete tuberculosis of a bronchial gland.

DR. RICHARDSON: On the report it said, "Clinical diagnosis, none made; question of sepsis."

The right pleural cavity contained at least 1800 cubic centimeters of thin pus coverglass from which showed leucocytes and streptococci. There were no old pleural adhesions. On the left side there were a few cubic centimeters of pus,—in other words, empyema on the right, purulent pleuritis on the left.

The bronchial glands were slightly enlarged and one of them showed fibrocalcareous degeneration. There was nothing in the lungs but edema and on the right side compression atelectasis from the empyema.

The pericardium contained at least 150 cubic centimeters of thin pus. The layers were coated with fibrinopurulent material, and in places there were small hemorrhagic areas—acute purulent pericarditis.

The heart weighed 2285 grams, a little large for her. The valves and cavities were negative. There was a little dilatation on the right. The coronaries were free, the aorta and great branch-

es, the pulmonary artery, veins, venae cavae, portal vein and radicles negative.

The spleen weighed 360 grams. The tissue was purplish brown-red, soft to mushy,—acute splenic tumor associated with the sepsis.

So all told there was empyema, purulent pleuritis, and acute pericarditis. We found no focus for the condition. Cultures from the heart blood and the spleen showed a profuse growth of the streptococcus.

DR. CABOT: Dr. Richardson, you have heard our history and our discussion; how do you put the whole thing together? Do you think it started as a blood septicemia which in the last days of life, after this X-ray picture was taken, localized itself in the pleura and pericardium? But we cannot say she had it when the picture was taken, and that was three days before death. So that I think we have to say that these weeks and months of fever were due to something that you have not found.

DR. RICHARDSON: There was some discussion about the throat, and some physician, I do not know whether here or outside, had thought that there might be buried pus, a deep abscess in the tonsils, which might explain it. However, the case is like those occurring in streptococcus epidemics with the portal of infection unknown.

DR. CABOT: I think if this necropsy were read without the history and the X-ray plate it would be misleading. There could not be an empyema with that X-ray plate three days before death, and there was no pericarditis of any amount certainly with no bigger shadow than that. So that what we have to think of is not merely what Dr. Richardson has found but what was there for months before. The things he has told us about were certainly terminal. Something preceded the lesions that he has told us about. I can think of nothing to add to what we have said. Someone asked, Can this be a generalized septicemia? and I said yes. I can think of nothing better now than a chronic blood septicemia, point of entrance unknown, with a terminal endocarditis and double pleurisy. But those did not really bulk in the case nearly as much as they seem to in the necropsy statement.

A PHYSICIAN: Would you get as much fluid as that in three days?

DR. RICHARDSON: That is a pretty large amount for that time.

A PHYSICIAN: Is it certain that those are the plates of this patient?

DR. CABOT: That is a very good point to inquire into. But I do not see how there could be any mistake on that, and the interpretation as we had it in the record is the same. I do not think that anyone knows enough to say that there could not develop such an empyema as that in three days.

A PHYSICIAN: Seeing nothing but this chart wouldn't you suspect right here that the patient had pneumonia and empyema? I can conceive of pus being there in three days' time.

DR. CABOT: I can conceive it. I have seen pus form very rapidly.

A PHYSICIAN: Was it thick or thin—how creamy?

DR. RICHARDSON: It was thin, slightly creamy pus.

DR. CABOT: Would you say the consistency of the pus told us how long it had been there?

DR. RICHARDSON: No, I don't think we can go much on that except to say that its thinness relates it more to recency.

DR. CABOT: There is another point which backs up my point that this is the right plate. That is that the staff were on their toes in this case. It came undiagnosed from another hospital. They had been puzzled and came down here puzzled. They must have examined those lungs again and again. It is quite possible they did not examine in the last two days. The patient may have been too sick. But it is not possible that they failed to find an empyema of 1800 c.c. that had been there for weeks. Is it possible that there could have been an abscess in the mediastinum which broke at the end?

DR. RICHARDSON: There was no evidence of that at the necropsy.

A PHYSICIAN: The X-ray findings of the hospital before she entered showed some pathology that these X-rays did not show.

DR. CABOT: Yes. It is worth while to go back over them. X-rays December 31 "showed a high diaphragm, the heart normal in outline, quite a considerable increased mottling out into the upper portion of both lobes and into the apices, no thickening of the apical caps. The appearance was that of a congestive inflammatory process somewhat like a bronchopneumonia, rather deep seated". That is the description of a chronic process, and not of anything in the pleura or in the pericardium. I do not know whether it has any relation to this empyema or to a pneumonia which I think may have preceded it.

A PHYSICIAN: Does the condition in the lung give any idea how long it may have been compressed by this fluid?

DR. RICHARDSON: Not for a great length of time.

A PHYSICIAN: If it was a chronic affair, why didn't it show on the plate here?

DR. CABOT: I agree. I guess we have gone as far as we can. We got as far as sepsis, but I never was more surprised than to hear Dr. Richardson say "1800 c.c. of pus".

A PHYSICIAN: I should like to ask if it is Dr. Richardson's opinion that there was enough organization of the inflammation here to indicate that this had been present for more than three days.

DR. RICHARDSON: I do not see how we can answer that except to say that it does not look as if the pus had been there a long while. There were no old adhesions at all; the pus simply coated the pleura.

CASE 12342

PERNICIOUS ANEMIA: TREATMENT BY A SPECIAL DIET

MEDICAL DEPARTMENT

An automobile factory mechanic forty-seven years old entered March 23 complaining of increasing weakness. His family for generations had had trouble with the digestive system. One cousin had "anemia". Ten years before admission to this hospital the patient had a partial thyroidectomy and a year later another. Since that time he had had slight exophthalmos. For the past year and a half his eyes had watered when a draft of air struck them. He had frequent head colds and catarrh every winter.

Four years before admission he began to have a gnawing sensation in the epigastrium and severe hunger pains before meals, usually relieved by food. Medicines given by several physicians gave no relief. His appetite, which was never good, began to be poorer. These symptoms increased, and his bowels became more and more constipated. Two years after the onset his tongue became raw and bled at times, so that he could not take anything hot or acid. He began to have nausea, especially after the evening meal, with the eructation of a good deal of gas and regurgitation of the food just eaten. When he lay down after supper he had less nausea and retained his food. He had several attacks of dizziness and weakness. For two years his stools had been black most of the time.

A year and a half before admission he became so weak and the symptoms were so marked that he had to give up work. After four months' treatment with liquid medicine and rest (no diet or transfusion) he felt well enough to go back to work, though he still had some gas and regurgitation of food. He worked four or five hours a day, sometimes nine hours, until five months before admission. Then one morning he suddenly became dizzy, nauseated and very weak, and fell. He was taken to a hospital. Since that time he had felt nauseated practically all the time, more so after the evening meal. The trouble with gas had increased. For the past year he had been dyspneic on exertion, recently much more so. He had had some palpitation of the heart. Small cuts had bled more than normally (?). He had been very sensitive to heat and cold, especially the latter, for the past four years. The year before admission his left hand became numb, later his right hand, and during the past two months his feet. The numbness had persisted. Six months ago he lost the senses of taste and smell completely. This loss had persisted also. Four years before admission he weighed 175 pounds. He had maintained his weight at 150 pounds during the past year.

Examination showed a well nourished man with marked pallor. The hair was iron gray. The eyes were slightly prominent. The sclerae were normal in color. Several teeth were missing. There was marked pyorrhea. The apex impulse of the heart was not located. The left border of dullness was 10 centimeters from midsternum, 0.5 centimeter outside the midclavicular line. There was no other enlargement to percussion. The pulses and arteries were normal. The blood pressure was 125/80 to 110/65. There was a soft blowing systolic murmur localized at the apex. The lungs and abdomen were normal. The liver and spleen were not felt. The feet and ankles showed slight edema. There were external hemorrhoidal tabs. The pupils and knee-jerks were normal. Romberg's sign was positive. There was diminished pain and touch sensation and vibratory sense in both hands, forearms, lower legs and feet, more marked on the left. There was slight ataxia of the left hand by finger-to-nose test, and diminished muscle (position) sense of the toes, more marked on the left. The tongue was smooth and pale, not raw or bleeding. There were scars resulting from the thyroidectomy and right hydrocelectomy. There was a small left hydrocele. The fingers and toes showed slight clubbing.

The amount of urine was 28 to 91 ounces a day. Specific gravity 1.010 and 1.020. A slight trace to a very slight trace of albumin was found at three of six examinations. The sediment showed a rare leucocyte and an occasional brown granular cast.

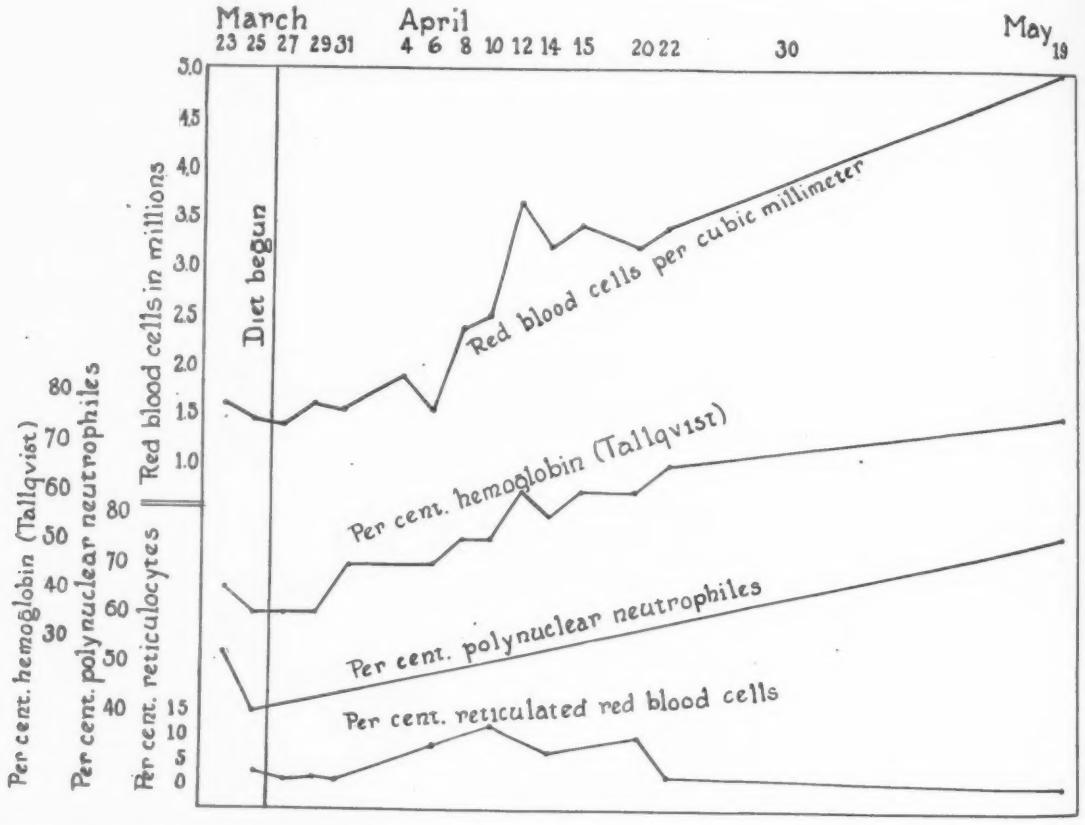
Blood: The hemoglobin percentage, count of red blood cells per cubic millimeter, and the percentage of polymorphonuclear neutrophiles and reticulated red blood corpuscles are shown in the accompanying chart. The white blood cell count varied between 3,700 and 7,400 per cubic millimeter from admission until April 19. On April 20 and 22 it was 17,000 and 13,000 per cubic millimeter respectively. During the first few days in the hospital the red blood cells showed in general macrocytosis. There was marked anisocytosis and poikilocytosis with numerous microcytes. Immature cells were present as shown by the occurrence of numerous polychromatophilic and occasional stippled and nucleated erythrocytes. The median diameter of the red blood cells was 8.42 microns, and the dispersion 2.05 microns. The blood platelets were somewhat decreased in numbers. The icterus index was 10. The Wassermann test on the blood serum was negative.

Gastric analysis showed no free hydrochloric acid in the fasting contents or samples of the contents removed after a test meal. The guaiac tests on these specimens were negative for occult blood.

X-ray examination showed no definite evidence of organic disease of the stomach or duodenum.

An eye consultant found moderate refractive error; vision normal with glasses.

The temperature was normal while the patient was in the hospital except for a rise to 99.8° April 21. The pulse was 63 to 100, the respiration normal.



March 26, three days after admission, the patient was put upon Dr. Minot's and Dr. Murphy's special diet (see discussion). The other orders were for fluids ad libitum, diluted hydrochloric acid half a dram diluted and concealed if necessary three times a day with meals, sipped through a tube; tannic acid in suppositories and gall and opium ointment for hemorrhoids; and Russian oil one ounce twice a day.

The patient was troubled with constipation and did not take the diet well at first. By April 5 his bowels were normal and he was taking the diet well. April 24 he was discharged to the Out-Patient Department with orders to continue the régime.

On May 19 his red and white blood corpuscles and blood platelets appeared essentially normal.

Discussion

BY GEORGE R. MINOT, M.D.

NOTES ON THE HISTORY

It is not customary to begin the discussion of a case with knowledge of the diagnosis, but to simplify my brief review I wish you to know that the case is one of pernicious anemia. I have not seen the patient, nor his blood.

In deciding whether or not a patient has pernicious anemia among other considerations one should determine:

(1) What are the individual's constitutional type, and hereditary characteristics?

(2) Have members of his family had pernicious anemia or any diseases that are associated with achylia gastrica, and has the patient this condition?

(3) Has he now or formerly had symptoms typical of pernicious anemia, such as those due to glossitis or referable to spinal cord degeneration?

(4) What symptoms can be attributed to anemia *per se*, such as dyspnea, palpitation, edema, weakness, et cetera?

(5) What is the character of his blood? is there occurring much or little destruction of the red blood corpuscles? what is the nature and rate of formation of the three formed elements derived from the bone marrow?

One should try to make the diagnosis before

the patient is pale or has the typical grape fruit colored tint to his skin dependent upon an abnormal degree of red blood cell destruction and an excess of bile pigments in the circulating blood.

This patient is forty-seven years old. Addison in his original description of the disease noted what is as true today as seventy-five years ago, that the majority of patients with pernicious anemia are past middle age. The highest percentage of fully developed cases for any ten year age period occurs in patients from fifty to sixty years old. Males perhaps are more prone to the disease than females.

Did his cousin simply have "anemia"? Did he die of anemia? One wonders, because a family history of pernicious anemia occurs in about 10 per cent. of cases. One also may learn from some of these patients that one or more of their relatives have died of "spinal cord diseases". Undoubtedly some of these have had pernicious anemia with pronounced symptoms due to spinal cord sclerosis. Furthermore members of a family in which one individual has pernicious anemia may suffer from indigestion for years, but present no obvious anemia; others may show that of a secondary sort, and still others later have typical pernicious anemia. Under such circumstances the digestive symptoms frequently are associated with achylia gastrica, a prominent feature of pernicious anemia. Thus the fact that this patient's family has had for generations "trouble with the digestive system" is of interest. One would like to know whether or not the difficulty occurred in members of both sides of his family. I suspect that relatives on only one side had "chronic dyspepsia". When pernicious anemia recurs in succeeding generations it is apt to cause symptoms at an earlier age in those of a younger than an older generation.

I do not believe that the patient's disorder of the thyroid gland is related in any way to the fact that he now has pernicious anemia.

The history of the gastro-intestinal symptoms makes one wonder if this man had or has a gastric or duodenal ulcer. Has he been bleeding constantly? I should like to know why the stools were black and whether they gave a positive test for occult blood. I will assume that the color of the stools was dependent upon the ingestion of iron and that blood was not present. We may account for the symptoms suggesting duodenal ulcer by the fact that he has achylia gastrica. You should know that achylia and achlorhydria may produce gastric symptoms of a sort commonly attributed to hyperacidity and ulcer. It is not unusual for patients with pernicious anemia to give this type of gastro-intestinal history. The X-ray examination shows in this case no lesion of the gastro-intestinal tract. In some of these cases the X-rays may reveal a disorder of the pylorus which can be shown to be due to spasm and in other cases to atony.

The patient's tongue symptoms are classical and characteristic of pernicious anemia. Recurring soreness of the tongue, which is usually shiny and often red, presenting tiny vesicles and denudation of the epithelium especially about the tip and edges, occurs in approximately seventy-five per cent. of cases. Progressive atrophy of surface of the tongue is the rule. I have an impression that a history of a transiently sore, burning tongue can be obtained more often from intelligent than from unintelligent patients. This symptom is often slight and forgotten, but sometimes is severe, and may be the first due to pernicious anemia to cause an individual to seek the advice of a physician.

The relapses and remissions that occur during the course of pernicious anemia are a feature of the disease. This patient's history indicates that he had a relapse followed by a remission and comes to the hospital in his second distinct relapse.

His dyspnea, weakness and palpitation can be accounted for by the anemia *per se*.

Patients with anemia feel the cold more than a normal person. Why he should have been sensitive to heat is of interest, in view of the previous trouble with his thyroid. His pulse is recorded as normal, and there is no evidence that he recently has had symptoms referable to hyperthyroidism. The sensitivity to heat may have been confined to his extremities and be attributable to degeneration of portions of the spinal cord. Atrophy of portions of the spinal cord is a feature of pernicious anemia, and numbness of the extremities such as this patient has had is often an early manifestation. The cord may be involved markedly long before anemia is obvious. Symptoms due to spinal cord lesions are more often a late manifestation and remain rather independent of the degree of anemia, although the intensity of the symptoms may be less when the red blood cell count is high than low. It is not rare to have spinal cord degeneration become evident by symptoms referable to one extremity, but more often both arms or legs are involved about equally.

The patient's loss of taste may be due to atrophy of the taste papillae associated with the atrophy of the tongue. It also may be caused by a central nervous system lesion.

Text books sometimes give the impression that pernicious anemia patients do not lose weight. Whether they do or not depends particularly on whether they eat and digest sufficient food. It is common for these patients to lose weight during their illness, and occasionally the weight loss may be extreme. A gain of weight is the rule during periods of improvement in health.

NOTES ON THE PHYSICAL EXAMINATION

In the examination of a patient one of the first things to think about is what kind of person presents himself. Addison, who first described pernicious anemia in 1849, wrote in 1856, "The disease occurs in patients of a somewhat large and bulky frame and with a distinct tendency to fat formation". Recently Dr. George Draper has studied the constitutional make-up of these patients. They are apt to approach a hyperpituitary type, and have wide facies, eyes set far apart, and wide jaw and costal angles. It is usual for them to have gray or white hair and to have had it turn so prematurely. (This man has iron-gray hair.) Patients with pernicious anemia also are prone to have blue or light colored eyes.

There has been a great deal of discussion about oral and other focal sepsis playing a rôle in the causation of this disease, but I think the best evidence is that it plays no important part. It is wise to have dental defects such as the pyorrhea alveolaris this man has attended to, quite as one should recommend for any person with this defect.

The slight edema of the ankles is probably dependent on the anemia.

The positive Romberg test gives further evidence of the spinal cord involvement, as does the loss of vibration sense.

A tuning fork and a stomach tube are both of great value in helping to decide whether pernicious anemia exists or not. Their use is apt to be neglected. The vibration sense (bone conduction) is tested by simply placing a vibrating tuning fork on different parts of the extremities and determining how long the vibrations can be felt. Diminution in this sense is very common in pernicious anemia, and is often the earliest demonstrable sign of spinal cord involvement. Sometimes it is detected as decreased before the patient is aware of any definite central nervous system symptoms. The stomach tube is useful because if achylia does not exist there is about ninety-nine per cent., perhaps one hundred per cent. chance that the case is not one of pernicious anemia. The study of a series of samples of gastric contents obtained at intervals (fifteen to thirty minutes for one and a half to two hours) after a test meal is a most valuable procedure. In this case the lack of free hydrochloric acid militated against the diagnosis of peptic ulcer and aided to establish that of pernicious anemia.

I wonder if this man's fingers and toes were really clubbed. I cannot account for this finding as due to pernicious anemia. Perhaps he had a slight degree of chronic arthritis. This condition is to be observed commonly in these patients, but it is frequent also in any group of persons over fifty years old.

The abnormalities of the urine can be attributed to the anemia. Anemia, particularly if severe and of long duration, can cause depression of renal function, which usually improves as the hemoglobin percentage and red blood cell count rise.

When this patient was anemic his blood picture was characteristic of pernicious anemia. The red blood cells showed a high color and volume index, varied markedly in size and shape and averaged larger than normal. There were also many microcytes to be seen in the blood smears. Furthermore leukopenia occurred and the blood platelets were reduced below normal in numbers.

When examining a blood smear one must study in detail all the elements it contains. Their significance must be evaluated with knowledge concerning numerous other factors such as the height of the red blood cell count. One must not for example simply record "Abnormal variation in size of the red blood corpuscles", but should note the degree and kind of variation. The presence of many fragmented and tailed microcytes indicates the occurrence of a markedly abnormal degree of red blood cell destruction, yet the blood in which they occurred might show no greater abnormal variation in the size of its corpuscles than another in which microcytes due to red blood cell destruction were rare.

It is important to know the approximate numbers of blood platelets in a case of pernicious anemia, because as Dr. Roger I. Lee and I pointed out some years ago*, as a rule the nearer their numbers and character approach normal the better will be the immediate future health of the patient. If one must make a prognosis for a case of pernicious anemia from but one laboratory determination he can do so best by knowing the number of platelets per cubic millimeter in the peripheral blood. Information given in a synopsis soon to be printed in the *Journal of the American Medical Association* of an article in a Swedish journal confirms this statement. It is not difficult to estimate from properly made and stained blood smears or cover glasses the number of blood platelets. If the preparations are improperly stained the blood platelets are often only lightly tinted and cannot be observed clearly, so that then they may be considered diminished when such is not the case.

The figures given in the record for the size of the red blood cells—"Median diameter 8.42 microns and dispersion 2.05 microns"—are arrived at from actual measurements of the diameters of a series of cells. From the data obtained a summation frequency curve is plotted on arithmetical probability paper. The figure for the median diameter, which is not the same as average or mean, indicates that there are as

*Boston Med. and Surg. Jour., Vol. 177, page 761, 1917.

many cells with diameters larger as there are smaller. Normally the median diameter is about 7.6 microns, and in this case it was 8.4 microns. This indicates there were a great many cells larger than normal. The dispersion of the diameters of the red blood cells gives the degree of variation in size of the cells. The figure for dispersion is that for the difference between the ones for the diameters of the cells recorded for the 84 and 16 percentile grades of the plot. Normally this figure is not over 1.3. This patient's cell diameters had a dispersion of 2.05 microns, which is much above normal. The data for red blood corpuscle diameters also may be studied and perhaps more simply, but less ideally, by ordinary percentage frequency curves. Measurements of red blood cell size give accurate physiologic, diagnostic and prognostic information of a sort that can be only guessed at by estimation of their size.

Those who have heretofore measured the diameters of the red blood cells from cases of pernicious anemia in remission have found them to show to some degree the size features observed in relapse. These measurements have been made when the red cell counts were between about three and four million per cubic millimeter. Dr. Donald N. Medearis and I have studied the red blood cell size of a series of cases when the count was between four and a half and six million per cubic millimeter, which was some time after the patients had begun and continued to take the special diet to be referred to later. In contrast to the abnorally large size and the greater degree of variation in size than normal recorded during remissions by others, we have found in our cases with high red blood cell counts that the diameters of the cells may become entirely within normal range. A paper concerning this is in preparation.

The figure for the icterus index expresses the amount of bile pigment in the blood or the degree of jaundice of the plasma. Normally this index is about 3 to 5. In pernicious anemia associated with the destruction of the red blood corpuscles and also presumably with some derangement of liver function the icterus index is increased, frequently markedly (40). The patient's color was not that of a grape fruit—so typical of many cases of pernicious anemia. This is because he had not retained in his tissues bile pigments in sufficient amounts to cause an icteric tint to his skin or sclerae. Likewise the icterus index showed the pigments had not accumulated in the blood to a great enough degree to cause them to enter the tissues in significant amounts.

NOTES CONCERNING TREATMENT

There are many important aspects concerning treatment that I shall not discuss here, as I shall only have time to discuss briefly the use of a special diet.

The special diet that this patient has continued to partake of since the fourth day after he entered the hospital is one composed of foods rich in complete proteins, particularly liver, contains an abundance of muscle meat, fruits and green vegetables, and is low in fat.

[When Dr. Minot discussed this case he gave a synopsis of Dr. William P. Murphy's and his unpublished studies made at the Peter Bent Brigham and Collis P. Huntington Hospitals upon the use and value of this diet in pernicious anemia. Their paper concerning a series of forty-five cases in which the patients were given the diet appeared in the *Journal of the American Medical Association,* vol. 87, page 470, August 14, 1926. Also a paper by them giving in detail the requirements of this special diet appears in this issue of the BOSTON MEDICAL AND SURGICAL JOURNAL. See page 410 of this issue. In order that no confusion may arise a repetition of their observations will not be repeated here.]

DR. MINOT: I wish to point out that many studies must yet be made to evaluate fully the effects of this diet, to determine the exact importance of the different foods, and to learn if there may not be some sort of food deficiency as a factor in the production of the disease, especially in people of a susceptible type or with a certain constitution. It is evident, however, that the ingestion of large amounts of cooked liver (preferably calves') or kidneys (preferably lambs') is of distinct importance.

The rather prompt and continued rapid increase of the numbers of this patient's red blood corpuscles per cubic millimeter of blood to greater numbers than are usually observed in remissions of pernicious anemia is entirely similar to what has been shown by other patients who have taken this diet. This patient responded to the diet faster than some others, but does not represent an exceptional case.

The prompt temporary rise of the reticulocytes (reticulated red blood corpuscles,—young cells) has been a feature of many other cases, as has also a rapid decrease in the icterus index to below normal.

We do not know what the effect of this diet will be on the duration of the disease. However, the unselected patients who have taken the diet have responded promptly and have had marked increase in their red blood cell counts. They have risen on the average from about 1,500,000 before the diet was begun to about 4,000,000 per cubic millimeter about ten weeks after it was instituted. The patients have had for at least some months much better health than similar groups of pernicious anemia patients treated by various other measures.

DR. WYMAN RICHARDSON: I saw this man May 19. He seemed in very good shape.

DR. CABOT: Would you recognize that he had pernicious anemia from his looks?

DR. RICHARDSON: No; he seemed perfectly well.

DIAGNOSIS

Pernicious anemia.

CASE 12343

A CASE OF UNCLASSIFIED ANEMIA WITH THROMBOPENIA AND LEUKOPENIA, MARKEDLY BENEFITED BY SPLENECTOMY

MEDICAL AND SURGICAL DEPARTMENTS

An American engineer twenty-three years old entered August 12 complaining of weakness.

Until nine months before admission he considered himself quite well, though for two or three years he had been told he looked anemic and sallow. The November before admission he began to have dyspnea on exertion, growing steadily more severe, rapidly during January, when he became very weak and could barely go upstairs. January 20 he gave up work and went to bed. From January 27 to July 7 he was in a hospital where he was given thirteen transfusions, the last about July 1. After the first and third transfusions he had severe reactions. For the first six weeks in the hospital he had oozing nosebleed, controlled by ice in the throat. His tonsils were removed, the first April 26, the second May 24. During his last few months in the hospital blood cultures were taken weekly. Two or three were positive for the streptococcus viridans. During the last five weeks the cultures were negative. Six weeks before he entered the Massachusetts General Hospital the red blood count was 3,000,000. At that time he went to Maine, where his red count fell steadily until August 9 it was 560,000. Shortness of breath was a prominent symptom throughout the illness. His appetite had been good until the past few weeks. While he was in Maine his appetite steadily decreased. For the past week he had vomited after nearly every meal and his bowels had been constipated. He was not able to read very well because of a dark spot before the right eye. He thought his memory was slightly changed recently.

His father died of heart trouble; otherwise his family history, occupational history, and social history showed nothing of significance. He had had the minor diseases of childhood, scarlatina, malaria and sore throats. He was a rather nervous man, continually moving.

Examination showed a well nourished, weak young man with extraordinary pallor of the skin and mucous membranes. The apex impulse of the heart was felt in the sixth space. The left border of dullness was 9 centimeters from midsternum, 2 centimeters outside the midclavicular line. There was no other enlargement to percussion. The sounds were of fair quality. The action was regular and rapid. There was a systolic murmur loudest at the base and a diastolic murmur immediately following the second sound just to the left of the sternum in the second and third spaces. There was a systolic thrill at the apex. The blood pressure was 130/55. Electrocardiogram showed normal rhythm, rate 105. The rest of the clinical examination was normal.

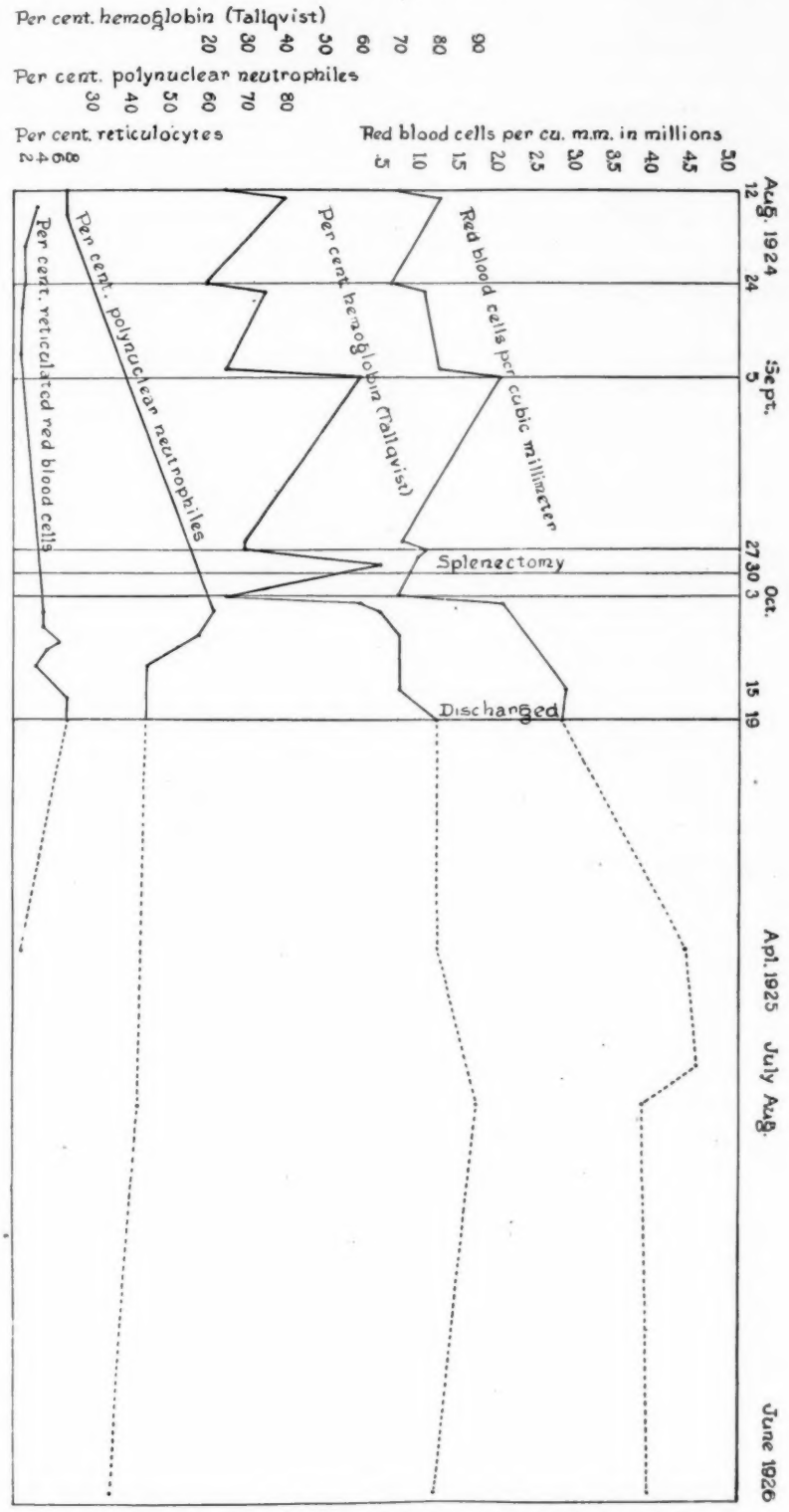
The amount of urine was 35 to 118 ounces on the few occasions recorded, cloudy at three of eight examinations, alkaline at two, specific gravity 1.004 to 1.018, the slightest possible trace to a slight trace of albumin at three examinations, ferric chloride positive once, occasional leucocytes at two of nine sediment examinations, rare red cells at one. The rise and fall in hemoglobin, red count, and reticulated cells before and after the transfusions and splenectomy are shown in the chart. Smear at entrance showed no achromia, moderate variation in size, some small cells but no true microcytes, macrocytes in fair abundance, considerable polychromasia, slight stippling, no poikilocytosis, no platelets. Polynuclears 24 per cent. Wassermann negative. A blood culture August 22 showed no growth in one tube, a questionable bacillus in the other. Coagulation time fifteen minutes. Clot retraction zero. Clot elastic but did not hold shape, flattened down when laid on hand and lengthened on holding up. Gastric analysis: fasting contents 220 cubic centimeters of slightly turbid whitish material, no free HCl, total acid 6 cubic centimeters, guaiac negative. The microscope showed a few epithelial cells. Test meal, 45 cubic centimeters whitish food particles, no free HCl, total acid 18 cubic centimeters, guaiac positive. Microscopic examination showed starch, epithelial cells and rare red blood cells.

X-ray. The teeth showed no evidence of focal infection. Sinus examination was not entirely satisfactory, but as far as could be made out there was no evidence of disease. . . . There was some deformity at the upper portion of the right chest. The apex on this side was much smaller than on the left. The intercostal spaces were narrowed. The diaphragm was in the usual position. The respiratory movements were normal. The costophrenic sinus was clear. There was nothing unusual in the appearance of the heart shadow. The root shadows were apparently increased in size and density, with some mottling along their course. No positive evidence of tuberculosis.

Consultants. Laryngologist: "No focus found in nose or throat. Tonsillar fossae clear." First internist: "In view of aortic valve involvement, purpura and history of positive blood cultures malignant endocarditis seems the explanation." Second internist, September 5: "I be-

lieve anemia of the primary type more likely than subacute bacterial endocarditis. The systolic at the apex and base are in my opinion as well explained by the anemia as to assume valve infection."

The orders were for anemia diet, forced fluids and fruit juices, pantapon, mercurochrome and sedatives.



The vertical lines mark the dates of the transfusions and the splenectomy.

August 12, 1924, 650 cubic centimeters of blood was transfused.

There was marked reaction with a chill after the first dose of mercurochrome, none after the

second. August 20 the diarrhea was gone. He had had no mercurochrome for three days. There was a loud systolic murmur at the base with a snapping aortic second sound. The mitral first sound was loud, but no murmurs were heard. The blood pressure was 145/70. The pulse was bounding. There was an ecchymotic area inside the right cheek where he bit himself. He had some bleeding from the nose at night. August 21 there were two questionable petechial spots on his right forearm. August 22 an hour after the administration of mercurochrome there was a chilly feeling, vomiting and diarrhea. For the next two days there was persistent vomiting and diarrhea. August 24 he looked ghost-like and was too weak to sit up. 750 c.c. of blood was transfused with improvement. Half an hour later he developed a diffuse urticaria, involving almost the entire body, relieved by ten minims of adrenalin. He improved and looked well. The diarrhea persisted until August 30. September 2 two small old ecchymoses were found in the right fundus.

September 5 600 c.c. of blood was transfused. There was oozing from the incision in the arm for twelve hours, with the loss of about 20 c.c. Purpuric spots appeared the next morning over the chest, the left shin, the left forearm and the back of the hand. There was a large ecchymosis around the subcutaneous injection site. The patient looked and felt much better. The night of September 6 he had a slight rise in temperature. The wound was slightly indurated, and the forearm distal to it slightly red. The following morning the temperature rose to 105° rectal. The wound was black around the old subcutaneous hemorrhages. There was serosanguineous discharge. The skin distal to the wound for eight to ten centimeters was almost board-like. There was some edema of the hand and forearm. The wound was opened and a wick put in. The temperature dropped during the forenoon, but the wound oozed about four ounces of serosanguineous material in spite of hemoplastin and Esmarch bandage. He was kept quiet with opiates. He looked very pale and washed out. September 11 the mitral first sound was reduplicated. There was some bleeding into the bandage that night, stopping after hemoplastin. During the next four days he made much improvement. By the 19th he was sitting up in the sun several hours daily with no ill effects. The wound was clean and granulating, with very little oozing. There were fifty or more small purpuric spots over the whole left lower forearm and hand. A tourniquet on the left arm brought out purpuric spots on the forearm. The transfusion wound on the left was still draining a little serum, but was not indurated or tender. The patient had a good appetite and was in very good spirits, though the red count was only 800,000.

September 27 100 cubic centimeters of blood was transfused. Dr. George R. Minot said in consultation, "Probably a primary bone marrow disease (certainly not pernicious anemia). Resembles chronic thrombopenic purpura with severe depression of the platelets and the red and white cell elements. Chronic 'malignant' endocarditis is perfectly plausible, but I favor the idea that the heart condition is explained by 'anemia.' Some could term the disease a form of aleukemia. Splenectomy to be considered as one concrete new thing to do. Risky, experimental, but offers possibilities." Cardiologist: "The case is unlike any that I have seen in either primary anemia or bacterial endocarditis. Diagnosis obscure." The consultant compared the case with a case of his own, a boy of twenty who had twenty-four transfusions. Splenectomy made him well for six months, but he died within a year. A second internist now advised splenectomy because he saw no alternative, though he felt the risk was great. Dr. Porter agreed to operate, though he also considered the risk great and gave a poor prognosis.

September 30 700 cubic centimeters of blood was transfused, and splenectomy was done. There was excessive bleeding. The spleen was found slightly enlarged. It was removed. Three or four bleeding points from the vasa brevia were also ligated. The wound was sutured in layers with extreme care. All bleeding was finally controlled. Pathological examination showed an increase in the stroma of the reticulum and a hyperplasia of the lymphoid cells of the pulp; no evidence of hematopoiesis. The pathologist's diagnosis was hyperplasia. October 3 transfusion of 1000 cubic centimeters of blood was done. The patient began to gain from that time. The blood picture showed a profound change. By the 19th there were some signs of regeneration such as nucleated reds, polychromatophilia, and increased reticulated count. Platelets were present, and tended to be large, though reduced in number. "The consensus of opinion is that improvement is too good to be true, and many feel that it is only a remission." October 19 the patient was discharged "partly relieved."

July 12, 1925, the patient wrote, "I feel great. I don't know as I ever felt any better. I now weigh 185 pounds. That is a gain of fifty pounds since October 19, but I have stopped gaining now, or I hope so. I had my blood count taken. It showed 4,600,000 reds. The blood pressure is 144/90 as compared with 168/100 in April. I go to dances sometimes twice a week. For the last month I have been at the beach. I have been in bathing every day. I swim quite a lot, play tennis, in fact do about anything. My appetite is immense."

August 14 the patient reported at the hospital. Blood examination showed 5,200 leucocytes, 3,920,000 reds, hemoglobin 85 to 90 per cent.

Tallqvist, differential count 41 per cent. polynuclears, 52 per cent. lymphocytes; very few platelets, slight achromia, central pallor, polychromatophilia and anisocytosis, very little poikilocytosis; lymphocytes quite fragile; many looked like plasma cells.

Discussion

BY CHARLES ALLEN PORTER, M.D.

I saw this patient only as a surgeon. The patient belonged to Dr. Aub. The diagnosis was not clear then, and is not clear now, although Dr. Minot himself has seen the case.

The red count was very low, only 590,000.

The chart shows the very marked rise in the red count and hemoglobin following the splenectomy,—a very big difference.

The risks of operation were three: (1) shock, as in any splenectomy; (2) a difficult complicated operation from adhesions about the spleen, which of course one could not estimate, and (3) in this case particularly the risk of having a hemorrhage from the operation wound or from the wound in the abdominal wall. So I approached the operation with a great deal of hesitation, though it seemed as if we had nothing to lose and might gain something. I tied everything I could with unusual care and was very careful about the hemostasis, and put in all the sutures I could, so as to control the hemorrhage by pressure. The many sutures were used in closing the abdomen of course, but also with the idea of controlling hemorrhage.

The truth is, however, that it was a real improvement. The operation was done on the first of October. On August 14, 1925, the blood examination was not quite so good. Also we have a report of this boy in October. He then weighed 187, a little more than his weight in July, and is, without any report of a blood examination, doing perfectly well. I think that before making my few remarks about splenectomy it will be interesting to ask Dr. Aub and Dr. Minot what they thought of this case beforehand.

Dr. Joseph C. Aub: I have very little to add. At the beginning he had a transfusion every two weeks and then every week. He was making practically no blood himself. His white count was low. It was Dr. Minot who suggested taking out the spleen. We did everything else we could think of before this was tried, and everyone thought the prognosis hopeless. But he was the best sport I ever saw, and was anxious to try every therapeutic procedure we suggested.

I am not prepared to make a diagnosis on the boy because I think I do not know what he had. I do not know now any more than I did then, but I feel sure that the splenectomy changed an apparently hopeless patient into a healthy young man.

Dr. George R. Minot: I can add very little. Names are misleading. I still feel, as apparently I felt two years ago, that he had a primary bone-marrow disease. If he had had no leukopenia, we have a perfectly typical case of chronic thrombocytopenic purpura, also known as chronic purpura hemorrhagica. That means a case where a patient carries very few blood platelets. They may live for years without any important symptoms of bleeding and then for some unknown reason they begin to get more anemic and pale, hemorrhages ensue, petechiae occur. Leukopenia is usually not a feature. Some cases do have it towards the end. The chronic cases do exceedingly well after splenectomy, quite as this patient has done. It is not an operation to perform except with great caution in the acute or subacute cases. Sunlight treatment may be of very definite value to these patients with few blood platelets. It can cause the platelets to increase considerably in numbers.

Dr. Porter: The question in this case was merely whether one would accept a risk, and we thought he did not have much more than a fifty-fifty chance of getting through the operation. He accepted it. We had no trouble whatever. There was no bleeding, no shock, no anything except a steady and continuous improvement.

In regard to splenectomy in pernicious anemia, before Dr. Minot's and Dr. Murphy's special diet was invented it was one of the things that was tried. It rather fell into disuse, because while there was not a very large mortality the results lasted only for a short time, and no cases were cured. We had here in all nineteen cases of splenectomy from 1914 to 1926, and only one death. That case I operated on in 1915. There was no transfusion and it was absolutely an error, as we look at it in retrospect. He would undoubtedly have survived a splenectomy now. There was a death six and a half, one at thirteen, one at fourteen months after operation; improvement lasting one month in one case, five weeks in one, three months, four months followed by relapse, five months, nine months, ten months, and of seven cases we have no record. But our results in this clinic have been no long improvement that I know of.

Dr. Minot: We reported nineteen cases in 1917*. The longest lasted not over three years after splenectomy.

[To this report may be added another case of pernicious anemia, a woman whose spleen was removed in August 1925. Concerning the very marked improvement she has made and maintained during the year Dr. Chester M. Jones writes:

> "'Was the remission due to splenectomy?' It is impossible to answer this question definitely, but I should say that it is highly probable that the remission was due

*George R. Minot and Roger I. Lee, Treatment of pernicious anemia—especially by transfusion and splenectomy. Boston Med. and Surg. Jour. Nov. 29 1917, Vol. 177 page 761.

to the removal of the spleen, inasmuch as previous transfusions had failed to keep the red count at even a moderately high level. Since splenectomy the red count has always been above 2,000,000, so that I think there is little doubt that this procedure did bring about a real remission.

"The patient has been on Dr. Minot's diet since approximately the first of this last April, so that there was a period of eight months in which she carried on a very much higher level as a result of splenectomy. Since April I think she has done somewhat better, but here again absolute answer is impossible. Prior to April she had had red counts over 3,000,000, and when last seen on the 9th of July she still had a red count of 3,400,000 with a hemoglobin of 70 per cent. At the end of June she had an acute infection of her parotid which I think may have temporarily lowered the red count, although I cannot be sure of this. It certainly changed the picture and made her feel rather badly for a period of some weeks. I have not seen her within the last few weeks, but I believe that recent improvement, especially as regards appetite and general vigor, is probably due to the diet which she has been on. This is merely an impression however, and I have no way of proving it. Her blood is not so high as she thinks it is, the last count being 3,400,000, but I should not be at all surprised to find a rise now that her acute infection is safely a thing of the past."]

DR. PORTER: I read Dr. Mayo's paper* reporting sixty-one cases. There were three deaths in the first nineteen, in the last forty-two none, and in all there was striking immediate benefit. Twenty-two per cent. lived two and a half times as long as a comparable group not splenectomized. About ten per cent. lived more than five years and were able to work. Dr. Mayo believes therefore that the present attitude against splenectomy is not justified; that it may be an operation to be done in a selected number of cases. That again was before the question of diet came up.

In splenic anemia and hemolytic jaundice splenectomy is a justifiable operation, particularly in hemolytic jaundice. Some of these cases have been jaundiced all their lives and sometimes in a week or two have lost the jaundice forever. The mortality is small with proper transfusions. Dr. Vincent thinks that in the splenic anemias and in hemolytic jaundice particularly we may have adhesions which must make the mortality about ten per cent. Also in hemolytic jaundice we have coincident trouble in about five per cent. Also we must consider the size of the patient. If it is a large patient with a very large spleen with adhesions it might be well simply to close the abdomen. That is, a surgeon wisely choosing the patients for splenectomy, which is quite simple, will have a very small mortality. But if he goes right ahead every time he is sure to have about ten per cent. of fatalities.*

*Mayo Clinics, 1924.

SPLENIC ANEMIA WITH SPLENECTOMY

Total cases, 1900-1923 inclusive	18
Recorded deaths:	
9 days after operation	1
13 " " "	1
4 weeks " "	1
6 " " "	1
6½ years " "	1
Recorded duration of improvement after operation:	
2 years 10 months ("perfectly cured")	1
2 "	1
1 " 10 "	1
1 " (then hematemesis)	1
6 months	1
2 "	2
5 weeks	1
No report	5

HEMOLYTIC JAUNDICE WITH SPLENECTOMY

Total cases, 1917-1924 (none later)	6
Recorded death (operative shock)	1

A PHYSICIAN: I should like to ask whether the use of mercurochrome proved useful?

DR. PORTER: I think that was on the assumption that there might be a bacterial endocarditis.

DR. AUB: We had two positive blood cultures from New York, and letters received from New York suggested the possibility of a bacteremia, so that we tried this form of therapy at first.

A PHYSICIAN: What was the blood coagulation time before operation?

DR. MINOT: Fifteen minutes, which is just above normal for the method used. The clot was non-retractile and abnormally soft.

A PHYSICIAN: Did he have calcium before operation?

DR. PORTER: No, he did not have any,—just the transfusion.

DR. CABOT: What has happened since last October?

DR. PORTER: Dr. Aub feels confident that he would have heard from him if he had not been going on all right. About December I had a letter from him to the effect that he was doing engineering work and was very well.

DR. MINOT: I heard from him on Easter Day, that he was doing perfectly well, and had nothing to complain of.

DR. CABOT: I agree with Dr. Minot that that is not a case of pernicious anemia. I am not particular what it is called, but I am quite strong on the negative. I suppose he may have oozed enough to give him that tremendous anemia in the beginning. It is not clear that he had. But of course a patient who is having oozing over a long period may get very anemic.

*The following reports taken from the hospital records are given for what they are worth. The notes on the condition following discharge mean very little, for it has not been possible to attempt to ascertain the results up to the present time. It must be borne in mind therefore that the short periods afer discharge for which good results are often reported do not mark the duration of improvement, but merely the date of our latest records.

DR. PORTER: I don't think he lost much blood.

DR. CABOT: Well, that would be a difficulty, wouldn't it, with the diagnosis of purpura?

DR. MINOT: We may assume that he had a combination of a depression of all three marrow elements and that the platelet elements were particularly involved. However, abnormal destruction of blood platelets probably played a rôle in their decrease.

DR. CABOT: First we just had purpura. That was a disease. Then we treated it as a symptom of various diseases. Then it was brought out that in one particular type of symptomatic purpura we had very low platelets, and that this was presumably the cause of the purpura. But now, as Dr. Minot says, there is a tendency to low platelets which can be the origin of an anemia without much hemorrhage. So that we can have a purpura without purpura, which is perfectly possible, only it is about time to change the term. That has happened time and again in medicine, and is part of our increasing knowledge of disease. If we can get back to a "primary" marrow change we shall call it, I suppose, aplastic anemia of a special type.

In regard to the general discussion of this subject of pernicious anemia and its treatment: My knowledge of the disease stopped about ten years ago. I have not seen any cases because I have been out of general practice since that time. Up to that time I had seen about a thousand cases, five hundred reported in Osler's *Modern Medicine* and about five hundred more which I have never published. So far as I know there is not one of those patients alive. That relates, as I say, to the period before that which Dr. Minot is speaking of, and does not contradict his figures in any way. But it makes a background which naturally makes me rejoice particularly in a new therapy in so far as it is good, and also makes me to a certain extent skeptical. I think this therapy, as Dr. Minot describes it, is distinctly ahead of any therapy that we have ever had. But it is a most disappointing disease clinically.

I have never forgotten a dramatic incident that happened in the Association of American Physicians. A member of the Association reported the case of his own wife, cured by eating bone-marrow. But a year or two later he had to report that she was dead. In other words it was a long remission. I call to mind the case of a physician practising medicine here in the suburbs. He came in here with a pernicious anemia. We treated him according to the fashion of the day, with arsenic. He got well in spite of it, went out, practised medicine for seven years, came back, and died in this hospital, under my care, of pernicious anemia. I do not think that was the result of any therapy. Nobody to-day thinks arsenic will cure or bring about a remission in pernicious anemia. In the article in Osler's system to which I referred I have put together the number of remissions which we have, and their length. Of course how many remissions we observe depends a good deal on the completeness of the history. Out of 524 cases that we had followed ourselves here at that time, twenty-four had five remissions, the average being not far from nine months. So there were twenty-four patients who certainly would have seemed to be in very good shape for a long time. Sixty-five had three remissions, 118 had two, and 296 had one. I do not believe this last figure is correct. I think they had really had more, only we did not get them into the history. These remissions in 100 cases were from nine to twelve months, and smaller numbers lasted both longer and shorter.

The striking thing about Dr. Minot's result, it seems to me, is that he gets his people up higher on their remission counts than most other people do. I am throwing out Dr. Porter's case, which I think a brilliant result in a case not pernicious anemia. But in the many years I have followed pernicious anemia cases I very seldom saw them go above 3,500,000. They would often go about their business with 2,500,000. Now Dr. Minot gets most of his cases above 4,000,000, and that I think is a new observation, and the most hopeful observation that has been reported in the literature.

As you know, there are a good many cures on the market. The hydrochloric cure is perhaps the favorite one. Dr. Hurst in England is fond of HCl combined with curing sepsis, but he reports very few cases. The advantage of Dr. Minot's treatment in that he comes out with the goods with forty-five cases. Forty-five cases is not to be sneezed at. That is a good round number. Most of those who have reported improvement under hydrochloric acid (as Hurst and Pitzman) have given us very few cases, and have not observed them nearly so long. So I believe that this announcement by Dr. Minot this year may turn out to be an epoch-making improvement.

DR. PORTER: There is no doubt whatever that anybody would rather eat liver than have his spleen removed. It seems to me that temporarily, at least, any question of splenectomy in pernicious anemia is absolutely relegated to the dump-heap. But in the future, inasmuch as there seems to be some evidence that splenectomy has some influence on pernicious anemia, may it not be possible that there will come a time when splenectomy will be done again when the diet does not cure? Perhaps it may come to a combination of the two, diet and splenectomy.

DR. MINOT: There is another aspect that has not been mentioned. We have no idea how long pernicious anemia patients are going to be benefited by the special diet. We do know that they improve rather promptly and markedly and have continued well for at least a number of months. What should be done about transfu-

sion? I do not remember accurately without my notes, but very few of the forty-five patients had a transfusion of blood close to the time they started to diet. I feel that transfusion should be used for these people to put them into good condition for their "medical operation" of eating the food contained in the special diet. Transfusion should be reserved for those who are very sick and unable to eat satisfactorily.

LATER NOTES

June 26, 1926, the patient writes a letter full of animation and good spirits. He is still feeling "fine," weighs 175 pounds, and thinks he is better for some loss, as he was too fat before. A blood examination made June 1, 1926, showed hemoglobin 80 per cent., reds 4,016,000, 5,600 leucocytes, 35 per cent. polynuclear neutrophiles. The platelets were not recorded.

August 2 Dr. Aub received from the patient some blood smears on slides. The red cells were large and well filled. The platelets seemed slightly reduced. Dr. Aub thinks however that this estimate is not worth much from smears made in this way. The smears were otherwise not abnormal.

NOTE BY DR. MINOT

The case is certainly not pernicious anemia, and in my mind resembles that disease in no way whatsoever. It is unfortunate that data concerning the number and character of the platelets are lacking. If the platelets remain below normal, as I think is probable, that practically establishes the diagnosis of a form of true thrombopenic purpura,—an unfortunate name, because purpura is often a rather minor symptom. One cannot change the facts at hand now. It is because of the probability that the platelets remain low that I suggest "greatly benefited by splenectomy" rather than "apparently cured".

The last time I saw the patient's blood was at least a year ago. At that time the platelets were somewhat below normal in numbers, which is just what one would expect in true thrombopenic purpura. I still believe that that is the diagnosis and that he had a marked depression of the white cell elements, which occurs in these cases but is not by any means the rule.

DIAGNOSIS

Unclassified anemia with thrombopenia and leukopenia.

STATEMENT MADE BY DR. S. JOSEPHINE BAKER AND QUOTED IN *BETTER HEALTH* FOR JULY, 1926

"THERE are in the schools of the United States today approximately 20,000,000 pupils. It is estimated that:

"300,000 to 400,000 of these have organic heart disease.

"1,000,000 at least have now, or have had, tuberculous disease of the lungs.

"1,000,000 have spinal curvature, or are flat-footed, or have some other deformity serious enough to interfere to some degree with health.

"1,000,000 have defective hearing.

"5,000,000 have defective vision.

"5,000,000 are suffering from malnutrition, in many cases due in part at least to one or more of the other defects enumerated.

"6,000,000 have enlarged tonsils, adenoids, or enlarged cervical glands which need attention.

"10,000,000 (in some schools as high as 98 per cent) have defective teeth, which are potentially if not actually detrimental to health.

"Several millions of the children possess, each two or more of the handicapping defects.

"15,000,000 of the school children in this country are in need of attention today for physical defects which are partially or completely remediable."

MALARIA TREATMENT OF PARESIS INSTITUTED IN THE BROOKLYN STATE HOSPITAL

THE treatment of paresis and tabes by inoculation with malarial organisms first undertaken and now vigorously advocated by Professor Wagner Jauregg of Vienna, has been tried and applied in numerous institutions treating those who are tabetic or paretic, and is now, with the approval of the Commissioner of Health, to be tried out in the Brooklyn State Hospital in Brooklyn, N. Y. This work is to be under the supervision of Dr. John L. Macumber.

In instituting this therapeutic procedure, it is of interest to note that from the public health point of view such malaria treatment must be so carried on as not to constitute a public hazard. There is practically no danger of malaria spreading if care is taken to completely screen the patients treated. The danger of spreading the disease, under proper precaution, is further minimized because malaria that propagates in the human host is in an asexual cycle and after several human passages gametocytes are no longer present in the blood. The anopheles mosquito is apparently unable to transmit this form of artificial malaria. Another factor of safety in New York City is the fact that there are no anopheles in this city at the present time. —*Bulletin N. Y. City Department of Health.*

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INFLUENZA

Whether or not this winter sees the fulfilment of the epidemiologists' prediction that we are to suffer again from a visitation of epidemic influenza, we must frankly acknowledge that we still are badly prepared to check its coming. Our experience in former epidemics has taught us little of its cause, or of the reasons why it suddenly rises from its torpor to such heights of infectiousness and virulence as it attained in the last pandemic. Nor have we learned how to prevent its spread.

When it comes again, whether it be this autumn or next autumn or any other year or season, we can, nevertheless, save many of its victims from its fatal effects.

We know that influenza itself is rarely fatal. We know that the disease is a toxemia, sometimes severe to be sure, but one usually of short duration, and void of any permanent damaging action on the body tissue. But like other toxemias, and quite exquisitely so in this case, it may cause a profound depression of the body's resistance to infection by other disease viruses and it is then that death stalks. The tissues of the respiratory tract have their natural defences lowered, and the streptococci, the pneumococci and the Friedlanders, lurking in the mouth and upper air passages, shower down on the vulnerable tissues of the trachea, bronchi and lungs. Then palliation is all that is left for us to practice.

It is this phase of influenzal disease that we can prevent. If, when the physician is called, he can convince the influenza patient of the danger that presents itself with the first coming of convalescence, and if he can keep the patient in bed, spare him all exposure and exertion and minister to his comfort and bodily well being, influenza will as a rule remain influenza and not change overnight into one or other of the deadly pneumonias, except in those cases when resistance is low because of some organic disease or definite functional derangement.

The aim then is to exert our every effort to shield the ones stricken with influenza from the direful effects that the seemingly mild intoxication may cause.

HAFF SICKNESS

An interesting account is contained in *Science* (July 30, 1926) of the mysterious German "Haff sickness," the discovery of its cause and its final elimination "virtually by government fiat".

"Haff sickness," which made its appearance a little over two years ago, was proving ruinous to a large part of the German Baltic fishing industry, affecting as it did fishermen in the stretch of shallow water along the southern end of the Baltic between Koenigsberg and Danzig, known locally as "the Haff". These fishermen began to develop a very painful and occasionally fatal illness, the symptoms of which were extreme pain and paralysis of some of the leg muscles, together with physiological disturbances. Its victims were always attacked while they were out in their boats, and generally in the early morning when the mists hung low over the waters. Recovery followed a few days on shore, but the symptoms recurred when fishing was resumed. The morale of the Haff fishermen was becoming badly affected.

The malady had none of the earmarks of an ordinary bacterial epidemic, and the theory that it was caused by eating spoiled fish had to be abandoned since many of the victims did not eat fish, and fish-eaters on shore were never affected.

Research on the morning mists was followed by the discovery of the cause, and it may truly be said that chemistry saved the day. Great quantities of factory waste were being discharged into the sea from cities along the shore, and these wastes contained arsenic compounds which were changed into gaseous forms by marine organisms. "Haff sickness" turned out to be arsenical poisoning which vanished within a few months when other materials containing a

lower percentage of arsenic were used in the manufacturing processes.

Water pollution and its prevention are receiving an increasing amount of notoriety in these modern days; "Haff sickness" represents a unique danger to which the toilers of the sea have been subjected.

DEATH RATES IN BOSTON

THE City of New York Department of Health published in its *Monthly Bulletin* last Spring a statistical report on the mortality and fecundity rate of sixteen of the large cities of the United States. It is of local interest to note where Boston stood in these various analyses, although the results will not generally be a matter of pride.

Los Angeles had the lowest crude death rate for 1925, with a very low figure of 9.55 per 1,000 of the population. Boston stood third from the bottom with a rate of 14.77, being exceeded only by Pittsburgh with 14.81 and Cincinnati with 15.95. The fact is brought out that the crude death rate is not a reliable index of general health conditions, as sex and age bear on the problem; for instance the death rate among females has always been lower than that among males, and a population with a large proportion of resident females will have a lower rate than one in which the males predominate.

San Francisco heads the table of birth rate and infant mortality with only 52 deaths under one year per 1,000 live births, but also with the lowest birth rate of 12.75. Boston is next to the bottom with an infant mortality of 86 and a birth rate of 23.60, exceeded only by Washington with an infant mortality of 87 and a birth rate of 18.42. The infant death rate is considered a much more reliable index of sanitary progress in a community than is the crude death rate.

Boston, with its death rate from important children's diseases of 42 stood in a class by herself; Philadelphia, the only near competitor, having a rate of 30, while San Francisco and Cincinnati tied for first rank with a rate of 10.

Boston was third from the bottom in death rates from organic heart disease, fourth from the bottom in death rates from tuberculosis, fifth from the bottom in death rates from pneumonia and influenza, and held the bottom position in death rates from cancer with a rate of 148 per 100,000 population as against Detroit's first place with a rate of 72. Perhaps Detroit's "cancer institute" is responsible for her relative immunity from deaths due to this cause.

These figures, if reliable, leave room for thought when we consider that Boston ranks very highly among the cities of the country for the excellence of her health activities.

THE INTERSTATE POST-GRADUATE ASSEMBLY OF NORTH AMERICA

On page 449 of this issue may be found the tentative program of the Interstate Post-Graduate Assembly of North America which will be held in Cleveland, Ohio, October 18, 19, 20, 21 and 22. This announcement is made early in order to enable those who may wish to attend to arrange for accommodations.

Every ambitious practitioner will find in this program something of interest and since the attendance will surely be large, reservations should be secured early.

Eminent men, authorities in special fields, will present the definite results of studies relating to most of the important phases of medicine and surgery. New England will be well represented.

This will be one of the most important meetings of the year.

THIS WEEK'S ISSUE

CONTAINS articles by the following authors:

MCFEE, WILLIAM D., M.D. University of Vermont 1897; Chief of Staff, Gale Hospital, Haverhill, Mass. Past President and Present Trustee, American Electrotherapeutic Association; Past Director of Physiotherapy Department of Walter Reed Hospital; Major in Medical Reserve Corps, U. S. Army. His subject is "Diathermy in Medicine," page 389. Address: 53 White Street, Haverhill, Mass.

BOVIE, W. T, A.B.; A.M.; Ph.D.; Assistant Professor of Biophysics, Harvard University; Research Fellow in Biophysics, Harvard Cancer Commission; Member, American Association for the Advancement of Science, American Academy of Science; Honorary Member of Massachusetts Medical Society, etc. His subject is "Biophysics of Ultra Violet Light," page 391. Address: 695 Huntington Avenue, Boston.

WYMAN, EDWIN T.; M.D. Tufts College Medical School 1911; Instructor in Pediatrics, Harvard Medical School; Assistant Visiting Physician, Children's Hospital; Visiting Physician, Infants' Hospital, Boston. His subject is "Clinical Application of Ultra Violet Light," page 396. Address: 483 Beacon Street, Boston.

HOLMES, GEORGE W., M.D. Tufts College Medical School 1906; Roentgenologist, Massachusetts General Hospital, and Assistant Professor of Roentgenology, Harvard Medical School. His subject is "The Present Status of Radiation Therapy in Carcinoma," page 399. Address: Massachusetts General Hospital, Boston.

LOMBARD, HERBERT L., A.B., M.D. Bowdoin Medical School 1915; M.P.H. Harvard School of Public Health; Epidemiologist, Massachusetts Department of Public Health, etc. Address: State House, Boston; and

DOERING, CARL R., A.B.; M.D. Baylor University College of Medicine, 1921; C.P.H.; D.Sc. Address: 55 Van Dyke Street, Boston. They write on "Influenza in Massachusetts," page 405.

MURPHY, WILLIAM P., A.B.; M.D. Harvard Medical School 1922; Associate in Medicine, Peter Bent Brigham Hospital, and Assistant in Medicine, Harvard Medical School. Address: 311 Beacon Street, Boston. Associated with him is

MINOT, GEORGE R., A.B.; M.D. Harvard Medical School 1912; Physician and Chief of the Medical Laboratories of the Collis P. Huntington Memorial Hospital; Associate in Medicine, Peter Bent Brigham Hospital; Assistant Professor of Medicine, Harvard Medical School; Special Consultant in Diseases of the Blood, Massachusetts General Hospital, etc. Address: 188 Marlboro Street, Boston. They write on "A Special Diet for Patients with Pernicious Anaemia," page 410.

SOPER, GEORGE A., A.M.; B.S.; Ph.D.; Sanitary Engineer in Charge of Rehabilitation, Galveston, after the flood 1899; had charge of suppression of typhoid epidemic, Ithaca, 1904, also in Watertown, 1905; Consulting Engineer in the investigation of subway air condition, N. Y. City 1906; Fellow, Royal Sanitary Institute, Great Britain, etc., and author of many scientific papers. Now Managing Director, American Association for the Control of Cancer. His subject is "The Key-Man in Cancer Control," page 411. Address: 25 West 43rd Street, N. Y. City.

HUBER, EDWARD G., A.B.; M.D.; D.P.H. See record on page 291 of BOSTON MEDICAL AND SURGICAL JOURNAL, Volume 195, No. 6. His article is continued on page 415 of this issue.

MISCELLANY

THE AIMS AND PURPOSES OF PUBLIC HEALTH*

ABSTRACT OF ADDRESS BY GEORGE E. VINCENT, PH.D.

PUBLIC health falls into three subdivisions. First there is sanitation of the environment; second, the control of communicable diseases; and third, that splendid field of hygiene. Plans for carrying on public health work in these various fields are being proposed in all parts of the world, and out of this somewhat chaotic condition there seems to be emerging a program about which people are by no means agreed, but nevertheless one which forms a basis for discussion. This program is arranged in a logical order. First of all we must attend to the sanitation of the environment, then to the communicable diseases, and next to hygiene. In considering hygiene we have many fields of activities such as prenatal care, maternal hygiene, infant, pre-school, and school hygiene, followed by industrial, social and mental hygiene. That is the program in its general aspect.

Jugoslavia has one of the best public health systems in the world. This is due almost entirely to one man—the chief medical officer of the Ministry of Health, Dr. Stampar. Dr. Stampar is a medical Napoleon. He has survived seventeen changes of ministry in the past few years. He divided Jugoslavia into 125 districts, and was fortunate in having some resources, because Jugoslavia was one of the first countries to get material reparations from Germany in the way of barracks and motor cars. Dr. Stampar had a great number of these assigned to him, and in every one of a large number of districts he put up a barrack with a doctor in charge. The doctor lived in one end of the building and the other end was turned into dispensary. In some cases there were a few beds. In establishing these health centers, he said, "We will make no difference between curative and preventive medicine. We will put a man in charge, give him a motor car, and he will do what he can in that particular district." In six years 125 active units were set up. Dr. Stampar trains these people—whom he gets from no one knows where. He has hygienic institutes and laboratories and recently also visiting nurses for the district. He believes in building up a system and personnel, and in gradually shifting stress from cure to prevention.

The adoption of a flexible public health program, uniform in its principles, but adapted to changed conditions all over the world, seems a sound principle on which to work. The basic idea is to keep everybody alive, if possible, and in the best possible condition for the greatest length of time. That is the only sound platform upon which to conduct public health work. Internationally, the communicable diseases of one country are the concern of every other country. For that reason, if for no other, we must do our best to control them. We do not urge this enough internationally.

The program of public health has been outlined. It is being adopted in many parts of the world, and the principles on which it is being conducted are a guide and afford a philosophy which we find fairly satisfying for the present.

How much of public health work should be done by public agencies and how much by voluntary societies? It seems that the responsibility for the sanitation of the environment and for the control of communicable diseases should be a public responsibility, but, of course, that does not mean that private agencies cannot do a great deal in that field. The greatest opportunity lies in educating the public. If private

*Delivered at the meeting of the Massachusetts Central Health Council at the Hotel Westminster, June 15, 1926.

agencies can be counted upon in emergencies to diffuse information, to make available sane ideas of public health precedures, they can accomplish an enormous amount toward helping the public authorities do their duty.

It seems to me that a splendid field in which private agencies may be pioneers is that of showing that these things can be done. When the success of the experiment has been proved beyond all doubt, when the particular phase of that activity in the public community has been shown to be necessary and feasible, it can be turned over to the public agencies. The field of preventive medicine is so rich, so widely extended that there is splendid opportunity for private agencies to do work of this kind, to be pioneers, to make demonstrations, and then to turn over to the authorities the project that has been made successful. We can do that in the United States, where it would be impossible in any other place in the world except England. In other places the extension of the functions of county councils and municipalities has gone on very rapidly, and in some cases has preceded the sort of thing we would expect private organizations to undertake. But it is particularly in harmony with the spirit of the United States that private agencies should play an important part in the early stages of work of this kind. This applies especially to child welfare and to everything that has to do with maternal care, the field of mental hygiene, and industrial hygiene. Only in a certain relationship does it become, or is it likely to become, a state function. Here is a field where private agencies have very large opportunities.

There are one of two dangers I should like to point out. One is that of overestimating what can be accomplished by this kind of work. There is nothing to be gained by claiming more than the facts will warrant, and there is nothing more dangerous than claiming anything in regards to the death rate. If you happen to do something and the death rate comes down, everything is satisfactory; but if you happen to explain what a magnificent work you are doing just as the death rate goes up, it is extraordinarily embarrassing. You can't explain the death rate. Of course, in many instances you can say the statistics are at fault. This is not true in Massachusetts, however. Massachusetts started early in recording statistics, did things well, and set an example to the rest of the world. In the long run the only thing that pays is the most careful and scrupulous attempt to discover the facts, and then to give those facts to the public as honestly and correctly as possible.

You in Massachusetts have a great responsibility, not only here, but in the rest of the United States. It is pure merit that forces us to look to Massachusetts for the best things in the country. You are the point of contagion for ideas from abroad. If you will study the way ideas get into America, you will find they usually get into Boston first, spread through Massachusetts, and then get into the rest of the country. If you look up the subject of public health work, you will find that the part Massachusetts has played has been one of constant leadership and suggestion to the rest of the country.

Whatever may be the faults of this organization, it is the symbol of your working together for a common cause which makes it significant. Because we cannot see the dawn of the millenium, nor see that all the things we do will eliminate disease and lengthen life, there is no reason for not doing day by day the thing that is indicated, and that science shows us how to do. By doing that not with sentimentality, or great emotional ardor, but with a steady loyalty and the application of truth quietly and persistently to the betterment of human life in the community in which we live and the larger community of which this is a part, we shall form a kind of common bond throughout the country.

SAVE THE BATHING BEACHES—NATURE'S PLAYGROUND

BATHING and swimming are a healthful form of recreation. The cooling effect of a plunge on a hot day refreshes and invigorates. Swimming brings into play many of the body muscles and is a splendid form of exercise. Each year the demand for recreational facilities increases. The automobile has placed within the reach of thousands shore areas which heretofore have been undeveloped. Construction of vast numbers of new summer homes has brought about rapid growth in value of shore front property. Bathing beaches are more than ever in demand.

Bathing beaches, then, have a twofold value—the provision of recreational facilities for large numbers of the state's citizens and the economic worth of shore front property which depends for its value upon the existence of bathing facilities.

The discharge of sewage by our cities and towns and of waste materials from industries is seriously menacing these important recreational resources of the state. With the best practical installations of sewage treatment, it will be impossible to reclaim some areas now abandoned for bathing, but we are faced with even worse curtailment. In the inner waters of harbors which have been used for the enjoyment of thousands for years past, and increasingly so recently, conditions are rapidly approaching the danger point. Promiscuous pollution of entirely clean areas constantly threatens and must be kept in check.

The Connecticut State Department of Health views with concern the possible necessity of closing bathing areas for the protection of the pub

lic health with attendant loss of recreational facilities. Surveys of bathing areas are being made as a measure of public protection and must be carried on with increasing diligence.

Conservation of this great natural resource is necessary. In many instances, the beaches are threatened with contamination from the very homes occupied by the families of the bathers.

Public opinion should be awakened to induce our cities and towns to do their share by providing sewage treatment. Arguments for installation of wastes' treatment plants are numerous but the threatening of one of nature's great gifts, *The State's Playgrounds* is alone enough to draw forth the deepest consideration. Public opinion, of course, must decide the issue, *"Shall the Bathing Beaches be Saved?"—Bulletin Connecticut State Department of Health.*

COURT UPHOLDS ACTION OF THE COMMISSIONER OF HEALTH FOR CONNECTICUT

THE New Haven County Superior Court has made the decision given below in regard to an individual, who after passing the Connecticut Eclectic Medical Examining Board in June, 1925, brought action against the state department of health to compel the state to issue him a certificate of registration or license to practice medicine in Connecticut.

Failing to secure this license, he started practicing medicine in Meriden and was prosecuted for such action. Following this, proceedings were taken at the New Haven County Superior Court which resulted in the following decision:

AMEDEO PASCIUTA VS. STANLEY H. OSBORN ET AL.

New Haven County Superior Court
June 9th, 1926

Memorandum of Decision

The Commissioner of Health is by statute made the administrative head of a department of primary importance. The function of the department is the preservation of the lives and health of the people of the State of Connecticut.

That a person in need of medical or surgical treatment shall receive skillful attention at the hands of a duly registered and licensed physician is of vital concern to civilization and to the departments of all enlightened government.

The health commissioner's decision that the relator is not entitled to practice is not to be upset unless his action is contrary to law. The extraordinary writ of mandamus is not to be granted under any circumstances if it will promote manifest injustice.

The relator made a sorry show of his fitness as he testified before me. His medical education was and is a sham. That the State of Connecticut should license him and hold him out to its people as a man qualified by education and experience to be the custodian of priceless lives is inconceivable. This Court will not be a party to such grievous public mischief. The application for a peremptory writ of mandamus is denied.

The law supports this denial. Sec. 2857 of the General Statutes requires that every applicant for examination under the provisions of this chapter shall be examined by the Committee representing the same school of practice in which the applicant was graduated. This applicant was not so examined. The St. Louis College of Physicians and Surgeons is not one whose graduates can lawfully be examined by our eclectic board.

The relator did not attend this school for four years. He fulfilled the requirement of law that his moral character be vouched for by two reputable citizens by producing the signatures of two doctors whose licenses have been revoked for fraud. The relator has been convicted of illegally practicing medicine in this state. The three members of the relator's examining board have had their licenses revoked on the ground of fraud.

If anything more should be said, it is related in the finding of a distinguished member of this court in Vol. 103 of the Connecticut Reports, Page 69-81.

(Signed) ELLS, *Judge.*

VERMONT MORTALITY STATISTICS: 1925

THE Department of Commerce announces that the 1925 death rate for Vermont was 1,458 per 100,000 population as compared with 1,379 in 1924. This increase in 1925 is largely accounted for by increases in the death rates from diseases of the heart (from 247 to 273 per 100,000 population), influenza (from 25 to 49), nephritis (from 113 to 132), and cancer (from 120 to 136).

Decreases in 1925 were in the death rates from tuberculosis, all forms (from 81 in 1924 to 71 per 100,000 population), pneumonia, all forms (from 102 to 95), and whooping cough (from 8 to 5). The death rate from measles in 1924 was 4 per 100,000 population, but no deaths from this cause were reported for 1925.

DR. CROFT OUT FOR SENATE NOMINATION

DR. BENJAMIN P. CROFT of Greenfield has announced his candidacy for the Democratic nomination for senator from the Franklin-Hampshire district. The news will be of interest throughout the district which has not nominated a Democrat for senator for some time. In Dr. Croft's formal announcement aside from personal and political considerations he emphasizes the greater local problem as follows:

"The District Responsibility: For over

seven years the southern end of our senatorial district has been harassed by the efforts of the Boston metropolitan area to increase its water supply from the Ware and Swift rivers and this purpose was finally accomplished at the last session of the legislature and ultimately portions of the towns of Ware, Enfield, Greenwich and Prescott will be completely wiped out. Although the source of the supply of water from the Ware and Swift rivers has been fixed by law, the question of adequate financial compensation and time of final taking has yet to be determined and additional enabling legislation will undoubtedly be necessary at the next session of the legislature. I feel that the senator elected to represent the citizens of this district at this next session, whether he be a Democrat or a Republican, should not only be sympathetic towards their claims, but courageous enough to insist upon working for their rights and do this with just as much energy as though the homes, land, and other vested interests of our neighbors in the lower valleys of the Deerfield or Millers rivers were threatened. If I am elected I shall endeavor to be of such service."

This announcement was made in the Greenfield Recorder.

RECENT DEATHS

BROWN—Dr. William John Brown of Reading died at the Massachusetts Homeopathic Hospital, Boston, July 17, 1926, aged 63.

Dr. Brown was born in Woburn on March 28, 1863, the son of Charles H. and Margaret Brown. He attended the public schools in Woburn and after the completion of his course in the High School entered the employ of the Woburn Postoffice as a clerk. While working there, his hours were arranged so that he could attend Boston University School of Medicine, where he received an M.D. in 1901. He began practice in Provincetown, moving to Reading some 20 years ago and joining the Massachusetts Medical Society in 1909. He had a large practice and had won many warm friendships. He was quiet and unassuming, duty always coming before anything else. In times of turmoil and excitement he always remained calm and collected and his comforting words to his patients made him a general favorite. He never married.

He was a member of Good Samaritan Lodge, A. F. and A. M.; Reading Royal Arch Chapter; Security Lodge, 208, I. O. O. F.; Woburn Encampment of Odd Fellows, and Reading Chapter, Knights of Pythias.

HARTWELL—Dr. Samuel Adams Hartwell, a retired physician, died August 9, 1926, at Cambridge, which had been his home for eleven years.

Dr. Hartwell once practised for a number of years in Louisville, Ky., which was his native city. He was a graduate of the Long Island College Hospital. Those surviving him are his widow, who was Alice Teay of Louisville; a son, Samuel Adams Hartwell, Jr., of Pittsburgh, Pa.; a daughter, Mrs. James Greenough of New York; a brother, Richard Hartwell of Louisville, and a sister, Mrs. John McFadon of Tacoma, Wash.

DORMAN—Dr. Franklin Abbott Dorman died suddenly of heart disease August 6, 1926, in New York.

Dr. Dorman was born in Upper Montclair, N. J., 52 years ago, the son of Franklin W. and Isabelle Taylor Dorman, and was educated at Montclair High School and Harvard University, graduating from the college in 1894 with a *cum laude*. Four years later he was graduated from the College of Physicians and Surgeons in New York. Dr. Dorman specialized in obstetrics and later went to the Sloane Hospital for Women as resident physician. At the time of his death he was head of the obstetrical division of Sloane Hospital. In September, 1909, Dr. Dorman married Miss Jane Chadwick Callander of Albany. Three sons and two daughters were born to them.

Dr. Dorman was a deacon of the Broadway Tabernacle and a trustee of the American University of Beirut, Syria. He was also a Fellow of the American Medical Association, a Fellow of the American College of Surgeons, a Fellow of the Academy of Medicine and a member of the Society of Alumni of Sloane Hospital.

EDMUNDS—Dr. Charles Dole Edmunds of Bangor, Me., died at his home in that city August 17, 1926, at the age of 67.

He was a graduate of Colby University in 1883 and of Harvard Medical School in 1886. He was a member of the Zeta Psi fraternity, the Elks and the A. O. U. W., also of the Maine Medical Association and the American Medical Association. He is survived by his widow and a grandson.

FINNEGAN—Dr. Francis Augustine Finnegan of Lowell died at Worcester, of coronary thrombosis, June 1, 1926, at the age of 42.

He was a graduate of Harvard Medical School in the class of 1911 and practised internal medicine, having been on the staff of St. John's Hospital.

SAUNDERS—Dr. Thomas Henry Saunders, a Fellow of the Massachusetts Medical Society, died at his home in Webster, of pulmonary tuberculosis, August 9, 1926, aged 46.

The son of Thomas and Isabel Haggerty Saunders, he was born in Webster, and was educated in the schools of that town and at Baltimore Medical College, where he took his M.D. in 1904. He joined the State medical society in 1918 and was a Fellow of the American Medical Association. His widow, who was Anna G. Mullen, survives him.

OBITUARY

JOHN WARREN ACHORN, M.D.

Dr. John Warren Achorn, for twenty years a practitioner of Boston, died at his summer residence at Annisquam, August 5, 1926, from heart disease, from which he had been a sufferer for several years. The son of Dr. John Taylor and Clara C. Achorn, he was born at Newcastle, Maine, January 30, 1857. When twenty years old he received an A.B. degree from Bowdoin College and then taught school in his native town, becoming superintendent of schools in 1880. That year and the next he was a publisher's agent and then entered the shipbuilding business, where he was employed until 1885, when he matriculated at the Medical school of Maine. His M.D. was given him by this institution in 1887 and two years later, having moved to New York, Bellevue Hospital Medical College gave him another M.D. Dr. Achorn served as house officer at the Brooklyn City Hospital and went over to the University of

Berlin, Germany, for further study, returning to settle in Boston, in 1891. In that year he joined the Massachusetts Medical Society. He published an article in the *Medical Record*, for September 19, 1891, entitled "The New Americans," showing the diseases of immigrants on shipboard, that was used by Senator Henry Cabot Lodge in the Senate. He appeared in court as an expert in medico-legal cases, was physician to the Invalid Aid Society and was one of the staff of physicians associated with the Rev. Ellwood Worcester in the Emmanuel Movement.

Dr. Achorn retired from practice in 1912 and moved to Pine Bluff, North Carolina, having a summer residence at Annisquam, Mass. He devoted much of his time to questions involving the public health and to the preservation of the animal and bird life of America, making many addresses and travelling extensively in advocacy of protection of migratory birds, and urging on Congress the passing of needed legislation to this end.

Dr. Achorn is survived by his widow, who was Miss Harriett Priscilla Sawyer, and by a brother, Edgar O. Achorn, a lawyer, of Jamaica Plain and Boston.

CORRESPONDENCE

THE WHITE CROSS AND THE SMOOT AND THE GREEN BILLS

Editor, Boston Medical and Surgical Journal:

The White Cross is convinced that narcotic addicts are sick people who need the care of physicians like other sick people. May we invite your attention to the Smoot Narcotics Bill (S. 4085) and the identical Green Bill, and to their effect on the medical profession, if they are passed by Congress?

Physicians have for years been hampered beyond endurance by arbitrary regulations whose slightest violation is punished with fines and imprisonment, often making it impossible for honest doctors to treat narcotic patients. An even worse result is the creation of organized armies of drug peddlers to whom the addict is forced to go when his doctor is not allowed to give him care.

These restrictions are no part of the law. The Harrison Drug Law expressly provides that its limitations on dealers should not apply to physicians in their regular professional practice. The restrictions are simply Revenue Bureau measures. While issued under color of carrying the law into effect, and doubtless with good intentions, they have reversed the intent of Congress and filled doctors with dread of prosecution until they dare not act.

The United States Supreme Court has recently declared some of these regulations unconstitutional. The Revenue Bureau, lest its unwarranted power should slip away, has now come out openly and introduced these new bills, inflicting the extreme penalty on doctors who dispense narcotics unless to a patient in hospital. It is almost incredible that a Bureau whose sole function is collection of revenue should assume to say that it and it alone is competent to direct American physicians in the practice of their profession. Moreover, if these bills become law it will not only bind the doctors hand and foot as regards narcotics patients, but it will open the way to still further invasion of the freedom of the medical profession. Why may not the Revenue Bureau go ahead and forbid calomel? Why not forbid quinine?

The United States is the only nation imposing such restrictions. In Great Britain the Ministry of Health in a recent official publication deprecates even the registration of addicts as "impairing the confidential character of the relation between doctor and patient.'

Many medical journals are already calling on physicians and medical societies to register their protests with their Congressional representatives. Enclosed is a memo of some expressions that have come to our hand. Quite possibly you also have already spoken to the subject in your journal, but even so may we not ask you to continue still further your protests? These bills, introduced with the prestige of the Revenue Bureau, and backed up by sinister outside influences, will undoubtedly be rushed through Congress in December unless strong and organized opposition overcome them.

Very truly yours,

WM. K. MCKIBBEN,
Executive Secretary, The White Cross.

A CRITICISM AND AN APPEAL

Editor, Boston Medical and Surgical Journal:

Allow me to call attention of the medical profession of this State to the recent resolutions passed by the Missouri State Medical Association about free clinics. It is about time that something should be done for the protection of our fellow practitioners. The average medical man has enough competition on his hands, from the Christian nonsense to the chiropractic. The drug store on the corner and, above all, the free clinics—so-called charity institutions—they all join hands to take away our bread and butter.

To get rid of the cults it is for us to educate the people of the United States medically; but to get rid of the free clinics for the rich and poor we have to educate ourselves. Let every physician refuse to attend any out-patient department that is competing and taking away the very bread and butter of his fellow practitioner.

The carpenter and painter are always fighting honorably for their bread and butter, but the physician, who works seven days per week and 24 hours a day, getting paid at times, thinks it is below his dignity to fight for his interest. Thousands of my fellow physicians will agree with me that it is absolutely wrong for any institution to give medical aid to those that can afford to pay a doctor. At every clinic of this city we find men and women of considerable wealth looking for charity. To meet real estate men or bootleggers at the out-patient department is a very common thing.

For the sake of the real poor patients who deserve charity, for the sake of our fellow practitioners who deserve an honest, decent living, I urge the Massachusetts Medical Society to follow the action and resolutions recently passed by the Missouri Medical Society: "That every patient will have to produce a statement from two reputable citizens that the patient applying for treatment is not able to pay for such treatment."

Charity to the poor, but justice to all.

WILLIAM FRANKMAN, M.D.

Boston.

RESUME OF COMMUNICABLE DISEASES FOR MASSACHUSETTS

JULY, 1926

GENERAL PREVALENCE

There were no communicable diseases which showed an increase over last month.

RARE DISEASES

Anterior poliomyelitis was reported from Cambridge, 1; Fall River, 2; Gardner, 4; Lowell, 1; Sa-

lem, 1; Saugus, 1; Springfield, 2; Winchendon, 1; Worcester, 8; total, 21.

Dog-bite was reported from Billerica, 3; Boston, 1; Chelmsford, 1; Chelsea, 1; Holyoke, 2; Lowell, 9; Peabody, 3; Revere, 4; Winthrop, 1; total, 25.

Encephalitis lethargica was reported from Boston, 3; Cambridge, 2; Haverhill, 1; Hull, 1; Lowell, 1; Northampton, 1; Springfield, 1; Worcester, 1; total, 11.

Epidemic cerebrospinal meningitis was reported from Boston, 5; Springfield, 1; Walpole, 1; West Springfield, 1; total, 8.

Malaria was reported from Boston, 1; Belmont, 1; Winchester, 1; Worcester, 1; total, 4.

Pellagra was reported from Fall River, 1; Worcester, 3; total, 4.

Septic sore throat was reported from Boston, 5; Littleton, 1; Lowell, 1; Peabody, 1; Watertown, 1; Weymouth, 1; Worcester, 1; Springfield, 1; total, 12.

Tetanus was reported from Boston, 1; Northampton, 1; New Bedford, 1; Springfield, 5; Worcester, 1; total, 9.

Trachoma was reported from Lawrence, 1.

Trichinosis was reported from Worcester, 1.

DISTRIBUTION

All Communicable Diseases

	July, 1926	July, 1925
Total cases (all causes)	4,807	4,288
Case rate per 100,000 population	113.8	103.1

Certain Prevalent Diseases

Diphtheria	July, 1926	July, 1925
Total cases	174	259
Case rate per 100,000 population	4.1	6.2

Measles	July, 1926	July, 1925
Total cases	917	1,037
Case rate per 100,000 population	21.7	24.9

Cases in cities and towns that have noticeably exceeded their median endemic indexes*:

Fairhaven	36	Holyoke	41
Walpole	21	Pittsfield	21
Warren	23		

Scarlet Fever	July, 1926	July, 1925
Total cases	628	269
Case rate per 100,000 population	14.9	6.4

Cases in cities and towns that have noticeably exceeded their median endemic indexes*:

Weymouth	58	Salem	27
Lynn	41	Somerville	32

Tuberculosis, Pulmonary	July, 1926	July, 1925
Total cases	513	415
Case rate per 100,000 population	12.2	9.9

Tuberculosis, Other Forms	July, 1926	July, 1925
Total cases	72	71
Case rate per 100,000 population	1.7	1.7

Typhoid Fever	July, 1926	July, 1925
Total cases	46	81
Case rate per 100,000 population	1.1	1.9

Whooping Cough	July, 1926	July, 1925
Total cases	599	619
Case rate per 100,000 population	14.2	14.9

*The median endemic index is obtained by arranging in arithmetical sequence the monthly totals of reported cases for the past five years and selecting the middle figure.

CONNECTICUT DEPARTMENT OF HEALTH

MORBIDITY REPORT FOR THE WEEK ENDING JULY 31, 1926

Diphtheria	9	Chickenpox	9
Last week	9	German measles	4
Diphtheria bacilli carrier	1	Influenza	1
Scarlet fever	16	Mumps	3
Last week	21	Paratyphoid fever	1
Whooping cough	32	Pneumonia, lobar	9
Last week	45	Poliomyelitis	2
Measles	25	Septic sore throat	2
Last week	48	Tetanus	1
Typhoid fever	4	Tuberculosis, pulmonary	27
Last week	2	Tuberculosis, other forms	1
Bronchopneumonia	16	Gonorrhea	56
Cerebrospinal meningitis	1	Syphilis	42

MORBIDITY REPORT FOR THE WEEK ENDING AUGUST 7, 1926

Diphtheria	16	Chickenpox	12
Last week	9	German measles	2
Diphtheria bacilli carrier	1	Influenza	5
Scarlet fever	15	Pneumonia, lobar	7
Last week	16	Poliomyelitis	1
Typhoid fever	7	Septic sore throat	2
Last week	4	Tuberculosis, pulmonary	28
Measles	78	Tuberculosis, other forms	1
Last week	25	Gonorrhea	19
Whooping cough	20	Syphilis	12
Last week	32		
Bronchopneumonia	6		

REPORTS AND NOTICES OF MEETINGS

ANNUAL MEETING OF THE AMERICAN ACADEMY OF PHYSIOTHERAPY

MONDAY AND TUESDAY, SEPTEMBER 6 AND 7, 1926

Headquarters and Place of Meeting, Hotel Pennsylvania, New York City

NOTICES

Time allotted to reading of each paper is 20 minutes and 10 minutes additional time for lantern demonstration. Seven minutes will be allowed for each discussion.

Each speaker is requested to first announce his name and residence.

Hotel reservation should be secured early by direct communication with Hotel Pennsylvania.

Meeting will be held South East Ball Room, Hotel Pennsylvania.

Tickets for the banquet, Monday evening, September 6, should be secured before 2:00 o'clock of that day. If due notice is given, fellows may procure extra tickets for members of their family and friends.

PROGRAM

MONDAY, SEPTEMBER 6, 1926

Morning Session

(Begins Promptly at 10:30 o'clock)

Registration and payment of dues.

Executive Session.

Scientific Session 11 A. M. President's Address, Frank B. Granger, M.D., Boston, Mass.

Papers

"Medical Diathermy," William D. McFee, M.D., Haverhill, Mass.

"The Treatment of Skin Diseases by X-Ray and Actinic Radiation," Herman A. Osgood, M.D., Boston, Mass.

"Studies on Arcus Senilis," Virgil C. Kinney, Wellsville, N. Y.

Afternoon Session

(2 o'clock)

"Fundamental Concepts of Physiotherapy," Joseph Resnik, M.D., Boston, Mass.

"Accidents from Electricity," Sinclair Tousey, M.D., New York.

"The Kinds of Appendicitis Which Yield to Physiotherapy," Robert T. Morris, M.D., New York. (By invitation.)

"Case Reports from a Private Orthopaedic Clinic" (Lantern Demonstration), Harold D. Corbusier, M.D., Plainfield, N. J.

"The Biophysics of Some Types of Impaired Hearing," Charles F. Stokes, M.D., New York.

"The First Reaction," Louis A. Bolling, M.D., LaFayette, Ind.

"Physical Features of High Frequency Apparatus and Some new Considerations of the Currents," A. P. Mooradian, New York. (By invitation.)

Monday Evening

Banquet, Hotel Pennsylvania

(7 o'clock)

Toastmaster, William S. Bainbridge, M.D.

Guests, Wendell C. Phillips, M.D., Joseph Riviere, S.C.D., M.D., Hon. Gaston Liebert, Capt. N. J. Blackwood, U.S.N., Karl W. Ney, M.D., Robert T. Morris, M.D., A. P. Mooradian, Frederick E. Lake, M.D., Louis Faugeres Bishop, M.D., A. H. Bass, M.D.

Tickets should be secured before 2 P. M.

TUESDAY, SEPTEMBER 7

Morning Session

(Begins Promptly at 9 o'clock)

Executive Session.

Report of Committees.

Election of officers.

Scientific Session 9:30 a. m.

Papers

"Physiotherapy Technicians; Their Training and Supervision," A. Bern Hirsh, M.D., New York.

"Experiences in the Physiotherapy Centers in Europe," William H. Magill, M.D., Providence, R. I.

"Remarks about Physiotherapy in Europe Observed on my Recent Trip," Harry Eaton Stewart, M.D., New Haven, Conn.

"Baldness—To Be or Not To Be," Lawrence Kendall Kelley, M.D., Peabody, Mass.

"Clinical Physiotherapy of the Intestines," Joseph Riviere, S.C.D., M.D., Paris. (By invitation.)

"Some Primary Factors in Disease," William Seaman Bainbridge, M.D., New York.

"Hydrotherapy," Thomas E. Hays, M.D., Burlington, Vt.

Afternoon Session

(2 o'clock)

"Ultra Violet Radiation in the Treatment of Dental Pathology" (Lantern Demonstration), Frederick W. Lake, M.D., Boston, Mass. (By invitation.)

"Relation of Physiotherapy to the Treatment of Heart Disease," Louis Faugeres Bishop, M.D., New York. (By invitation.)

"The Treatment of Carcinoma of the Breast by Combined Methods" (Lantern Demonstration), H. H. Bass, M.D., Henderson, N. C. (By invitation.)

"Miscellaneous Uses for the Desiccation Method" (Lantern Demonstration), William L. Clark, M.D., Philadelphia, Pa.

"Roentgen Therapy Applied to Pathology of Lymphoid Tissue," Walter C. Barker, M.D., Philadelphia, Pa.

"Radium and Electrothermic Methods in the Treatment of Lesions of the Tongue," Grant E. Ward, M.D., Baltimore, Md.

For more details apply to Dr. B. S. Price, 43 E. 53rd St., New York City.

TENTATIVE PROGRAM

INTER-STATE
POST GRADUATE ASSEMBLY
OF NORTH AMERICA

CLEVELAND, OHIO

OCTOBER 18TH, 19TH, 20TH, 21ST AND 22ND

General Headquarters for all scientific sessions and Exhibits, Municipal Auditorium.

Hotel Headquarters: Hotel Cleveland

On October 15th and 16th there will be pre-assembly clinics in the hospitals of Cleveland

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FIRST DAY

MONDAY, OCTOBER 18TH

7 A.M.

1. *Diagnostic Clinic (Medical).* Dr. Campbell P. Howard, Prof. of Medicine, McGill University Faculty of Medicine, Montreal, Canada.

2. *Diagnostic Clinic (Surgical).* Dr. George W. Crile, Cleveland Clinic, Cleveland, Ohio.

3. *Diagnostic Clinic (Medical).* Dr. Friedrich Mueller, Prof. of Medicine, University of Munich, Munich, Germany.

4. *Diagnostic Clinic (Surgical).* Dr. Clarence L. Starr, Prof. of Surgery, University of Toronto, Faculty of Medicine, Toronto, Canada.

Gynecological Symposium.

5. *Diagnostic Clinic and Address.* Cases of Uterine Fibroids. *"The Rational Treatment of Tubal Disease."* Dr. C. Jeff Miller, Prof. of Obstetrics and Clinical Gynecology, Tulane University, New Orleans, Louisiana.

6. *Diagnostic Clinic and Address.* Pelvic Cases. *"Pelvic Infections."* Dr. F. W. Marlow, Associate Prof. of Gynecology, University of Toronto Faculty of Medicine, Toronto, Canada.

Intermission

Review Exhibits

7. *Diagnostic Clinic and Address.* Pelvic cases. *"Displacement of Uterus and Vaginal Walls."* Dr. Howard C. Taylor, Prof. of Clinical Gynecology, Columbia University School of Medicine, New York, N. Y.

8. *"The Contrasting indications for Surgery and Radiation in the Treatment of Tumors of the Uterus."* Dr. J. O. Polak, Prof. of Obstetrics and Gynecology, Long Island College of Medicine, Brooklyn, New York.

9. *"New Researches concerning Cyclic Processes in the Female Genital Organs."* Dr. A. H. M. J. Van Rooy, Prof. of Obstetrics and Gynecology, University of Amsterdam, Amsterdam, Holland.

10. *"Uterine Hemorrhages; Causes and Control."* Dr. Albert Doderlein, Prof. of Obstetrics and Gynecology, University of Munich, Munich, Germany.

AFTERNOON SESSION

1 P.M.

PROBLEMS OF CHILD BEARING—*Symposium*

11. *"Sterility, Abortion and Miscarriage."* Dr. Barton Cooke Hirst, Prof. of Obstetrics, University of Pennsylvania School of Medicine, Philadelphia, Pennsylvania.

12. *"Certain Important Medical Complications of Pregnancy."* Dr. William W. Herrick, Associate Prof. of Clinical Medicine, Columbia University School of Medicine, New York, N. Y.

13. *"Indications for Cesarean Section."* Dr. Arthur H. Bill, Prof. of Obstetrics, Western Reserve University School of Medicine, Cleveland, Ohio.

14. *"Surgical Complications of Pregnancy; Appendicitis; Tumors of the Uterus; Tumors of The Breast; Hyperthyroidism; Acute Ileus."* Dr. George W. Crile, Cleveland Clinic, Cleveland, Ohio.

Intermission

Review Exhibits

15. *"Pyloric Stenosis in Infants."* Dr. Richard W. Bolling, New York, New York.

16. *"Problems of Infant Feeding."* Dr. H. J. Gerstenberger, Prof. of Pediatrics, Western Reserve University School of Medicine, Cleveland, Ohio.

17. *"Nephritis."* Dr. Friedrich Mueller, Prof. of Medicine, University of Munich, Munich, Germany.

18. *Address in Pediatrics.* Dr. N. Gurgel, Prof. of Medical Pediatrics and Child Hygiene, Faculty of Medicine, University of Rio de Janeiro, Rio de Janeiro, Brazil.

EVENING SESSION

7 P.M.

CANCER—*Symposium*

19. *"Carcinomata of the Buccal Cavity."* Dr. Joseph Bloodgood, Associate Prof. of Surgery, Johns Hopkins University School of Medicine, Baltimore, Maryland.

20. *"Is Cancer the Result of an Infectious Process?"* Dr. Francis C. Wood, New York, New York.

21. *Demonstration of the Growth of Tissue by means of moving pictures.* Dr. Alexis Carrel, Rockefeller Institute, New York, New York.

22. *"End Results of the Treatment of Cancer and the Factors determining them."* Dr. Robert Greenough, Assistant Prof. of Surgery, Harvard Medical School, Boston, Massachusetts.

SECOND DAY

TUESDAY, OCTOBER 19TH

7 A.M.

1. *Diagnostic Clinic (Surgical).* Mr. David P. D. Wilkie, F.R.C.S., Prof. of Surgery, University of Edinburgh, Edinburgh, Scotland.

2. *Diagnostic Clinic (Medical).* Dr. Henry A. Christian, Prof. of Medicine, Harvard Medical School, Boston, Massachusetts.

3. *Diagnostic Clinic (Surgical).* Sir William I. de Courcy Wheeler, Dublin, Ireland.

4. *Diagnostic Clinic (Medical).* Dr. A. Simonena, Prof. of Medicine, University of Madrid, Madrid, Spain.

5. *Diagnostic Clinic (Surgical).* Dr. Dean D. Lewis, Prof. of Surgery, Johns Hopkins University School of Medicine, Baltimore, Maryland.

6. *Diagnostic Clinic and Address.* Abdom-

inal cases. *"Acute Abdominal Lesions."* Dr. John F. Erdman, Prof. of Surgery, New York Post Graduate School of Medicine, New York. N. Y.

Intermission.
Review Exhibits

7. *Diagnostic Clinic and Address.* Rectal and colon cases. *"Carcinoma of the Rectum and Colon."* Dr. Daniel F. Jones, Boston, Massachusetts.

8. *"Dilatation of the Duodenum."* Mr. David P. D. Wilkie, F.R.C.S., Prof. of Surgery, University of Edinburgh, Edinburgh, Scotland.

9. *"Surgical Indications and End Results of Operation for Ulcer of the Stomach."* Sir William I. de Courcy Wheeler, Dublin, Ireland.

10. *"Surgical Indications and End Results of Operations for Cancer of the Stomach."* Dr. Donald C. Balfour, Pref. of Surgery, University of Minnesota, Graduate School of Medicine, Mayo Clinic, Rochester, Minnesota.

11. *"Intestinal Toxemia."* Dr. Mariano R. Castex, Prof. of Clinical Medicine, National University of Buenos Aires, Buenos Aires, Argentina.

AFTERNOON SESSSION
1 P.M.

12. *"Medical Treatment of Ulcer of the Stomach."* Dr. Franklin W. White, Boston, Massachusetts.

13. *"The Indications and Contra-indications for Surgical Interference in cases of Duodenal Ulcer."* Dr. Campbell P. Howard, Prof. of Medicine, McGill University Faculty of Medicine, Montreal, Canada.

14. *"The Achlorhydria group of Disturbances."* (Presentation of cases.) Dr. Henry A. Christian, Prof. of Medicine, Harvard Medical School, Boston, Massachusetts.

15. *"The Postmortem."* Dr. Howard T. Karsner, Prof. of Pathology, Western Reserve University School of Medicine, Cleveland, Ohio.

Intermission
Review Exhibits

16. *Address in Surgery.* Dr. Ferdinand Sauerbruch, Prof. of Surgery, University of Munich, Munich, Germany.

OTO-LARYNGOLOGY—*Symposium*

17. Dr. Perry G. Goldsmith, Prof. of Oto-laryngology, University of Toronto Faculty of Medicine, Toronto, Canada.

18. Dr. Samuel Crowe, Prof. of Oto-laryngology, Johns Hopkins University School of Medicine, Baltimore, Maryland.

19. *Address in Medicine.* Prof. Doleris, President, Academy of Medicine, Paris, France.

EVENING SESSION
7 P.M.

STUDIES IN APPLIED ANATOMY

20. *"Treatment of Hernia."* Dr. Carl A. Hamann, Dean and Prof. of Clinical Surgery, Western Reserve University School of Medicine, Cleveland, Ohio.

21. *"The Alimentary Canal of the Medical Student—Radiographic Studies."* Dr. T. Wingate Todd, Prof. of Anatomy, Western Reserve University School of Medicine, Cleveland, Ohio.

PHYSIOLOGICAL STUDIES

22. *"The Newer Physiology of the Gastro-Intestinal Tract."* Dr. Andrew C. Ivy, Department of Physiology, University of Chicago School of Medicine (Rush), Chicago, Illinois.

23. *"Present Knowledge of the Function of the Liver."* Dr. Francis Peyton Rous, Pathologist, Rockefeller Institute for Research, New York, New York.

THIRD DAY

WEDNESDAY, OCTOBER 20TH
7 A.M.

1. *Diagnostic Clinic (Medical).* Dr. Charles F. Hoover, Prof. of Medicine, Western Reserve University School of Medicine, Cleveland, Ohio.

2. *Diagnostic Clinic (Surgical).* Dr. William D. Haggard, Prof. of Surgery, Vanderbilt University School of Medicine, Nashville, Tennessee.

3. *Diagnostic Clinic (Medical).* Dr. Hans C. Jacobaeus, Prof. of Internal Medicine, University of Stockholm, Stockholm, Sweden.

4. *Diagnostic Clinic (Surgical).* Dr. Harvey Cushing, Prof. of Surgery, Harvard Medical School, Boston, Massachusetts.

5. *Diagnostic Clinic (Surgical).* Chest cases. Dr. Ferdinand Sauerbruch, Prof. of Surgery, University of Munich, Munich, Germany.

Intermission
Review Exhibits

RESPIRATORY AND CIRCULATORY DISEASES
Symposium

6. *"Methods and Results in the Treatment of Empyema."* Col. William L. Keller, Medical Department, United States Army, Surgeon-in-Chief, Walter Reed General Hospital, Washington, D. C.

7. *"Lung Abscess—Roentgenographic Aspects."* Dr. Walter C. Hill, Cleveland, Ohio.

8. *"Lung Abscess—Surgical Aspects."* Dr. Evarts Graham, Prof. of Surgery, Washington University School of Medicine, St. Louis, Missouri.

9. *"Praclical Use of Thoracoscopy."* Dr. Hans C. Jacobaeus, Prof. of Internal Medicine, University of Stockholm, Stockholm, Sweden.

AFTERNOON SESSION
1 P.M.

10. *"Summary of Experiences up-to-date in the surgical treatment of Angina Pectoris."* Dr. Elliott C. Cutler, Cleveland, Ohio.

11. *"Aortitis and Heart Failure."* Dr .Roy W. Scott, Cleveland, Ohio.

12. *"Effects of Diseases of the Thyroid, on the Heart and their Treatment."* Dr. Cyrus C. Sturgis, Peter Bent Brigham Hospital, Boston, Mass.

BRAIN AND CENTRAL NERVOUS SYSTEM
Symposium

13. *"Ventriculography."* Dr. Walter E. Dandy, Associate Prof. of Clinical Surgery, Johns Hopkins University School of Medicine, Baltimore, Maryland.

14. *"The Present Status of our Knowledge of the Pituitary Body."* Dr. Harvey Cushing, Prof. of Surgery, Harvard Medical School, Boston, Massachusetts.

15. *"Meningeal Adhesions and their Clinical Signs."* Dr. Samuel Clark Harvey, Associate Prof. of Surgery, Yale University School of Medicine, New Haven, Conn.

16. *"Teachings of Epidemic Encephalitis in regard to the General Physiology and Pathology of the Nervous System."* Dr. August Wimmer, Prof. of Psychiatrie, University of Copenhagen, Copenhagen, Denmark.

17. *"Results of Peripheral Nerve Lesions in Civil Life."* Dr. Dean D. Lewis, Prof. of Surgery, Johns Hopkins University School of Medicine, Baltimore, Maryland.

EVENING SESSION
7 P.M.

ORTHOPEDICS AND RECONSTRUCTION SURGERY
Symposium

18. *"Fractures of the Long Bones."* Dr. William Darrach, Dean and Associate Prof. of Surgery, Columbia University School of Medicine, New York, New York.

19. *"Fractures of Metacarpal Bones due to Torsion, or Schlatter's Disease."* Dr. Karl Schlatter, Prof. of Surgery, University of Zurich, Zurich, Switzerland.

20. *"Position of Orthopedics in Medical Instruction."* Dr. Patrik Haglund, Prof. of Orthopedic Surgery, University of Stockholm, Stockholm, Sweden.

21. *"Attidunal Strains."* (Presentation of cases.) Dr. Robert B. Osgood, Prof. of Orthopedic Surgery, Harvard Medical School, Boston, Massachusetts.

22. *"Orthopedic Management of Visceroptosis."* (Presentation of cases.) Dr. Joel E. Goldthwait, Boston, Massachusetts.

23. *"The Arthritides."* Dr. William S. Baer, Associate Prof. of Orthopedic Surgery, Johns Hopkins University School of Medicine, Baltimore, Maryland.

24. *"Reconstruction in Surgery in Civilian Practice."* Dr. Clarence L. Starr, Prof. of Surgery, University of Toronto Faculty of Medicine, Toronto, Canada.

25. *"Transplantation of Foreign Bodies in Orthopedic Practice."* Dr. Fritz Lange, Prof. of Orthopedic Surgery, University of Munich, Munich, Germany.

FOURTH DAY

THURSDAY, OCTOBER 21ST
7 A.M.

1. *Diagnostic Clinic (Surgical).* Dr. Arthur Dean Bevan, Prof. of Surgery, University of Chicago School of Medicine (Rush), Chicago, Illinois.

2. *Diagnostic Clinic (Medical).* Dr. Mariano R. Castex, Prof. of Clinical Medicine, National University of Buenos Aires, Buenos Aires, Argentina.

3. *Diagnostic Clinic (Surgical).* Dr. Charles H. Mayo, Prof. of Surgery, University of Minnesota Graduate School of Medicine, Mayo Clinic, Rochester, Minnesota.

4. *Diagnostic Clinic (Medical).* Dr. James B. Herrick, Prof. of Medicine, University of Chicago School of Medicine (Rush), Chicago, Illinois.

5. *Diagnostic Clinic (Surgical).* Dr. John B. Deaver, Prof. of Surgery, University of Pennsylvania Graduate School of Medicine, Philadelphia, Pa.

Intermission
Review Exhibits

GOITER—*Symposium*

6. *Diagnostic Clinic and Address.* Goiter cases. *"Intrathoracic Goiter."* Dr. Francis H. Lahey, Boston, Massachusetts.

7. *Diagnostic Clinic and Address.* Thyroid cases. *"Cancer of Thyroid."* Dr. Eugene H. Pool, Clinical Prof. of Surgery, Columbia University School of Medicine, New York, New York.

8. *"The Clinical Use of Iodin."* Dr. Henry S. Plummer, Prof. of Medicine, University of Minnesota Graduate School of Medicine, Mayo Clinic, Rochester, Minnesota.

AFTERNOON SESSION
1 P.M.

GALL BLADDER AND LIVER—*Symposium*

9. *"Differential Diagnosis between Gastric and Duodenal Ulcer and Gall Stones."* Dr. William D. Haggard, Prof. of Surgery, Vanderbilt University School of Medicine, Nashville, Tennessee.

10. *"Re-study of the Bile Tracts."* Dr. Arthur Dean Bevan, Prof. of Surgery, University of Chicago School of Medicine (Rush), Chicago, Illinois.

11. *"The Hepatic Cirrhosis of Surgical Delay."* Dr. John B. Deaver, Prof. of Surgery, University of Pennsylvania Graduate School of Medicine, Philadelphia, Pennsylvania.

Dr. Stanley P. Reimann, Prof. of Experimental Pathology, University of Pennsylvania School of Medicine, Philadelphia, Pa.

INFECTION—*Symposium*

12. *"Present Status of Serum Therapy in the Treatment of the Exanthemata."* Dr. J. G. FitzGerald, Prof. of Hygiene and Preventive Medicine, University of Toronto Faculty of Medicine, Toronto, Canada.

13. *"Recent Advances in our Knowledge of Pneumonia."* Dr. Russell L. Cecil, Bellevue Hospital, New York, New York.

14. *"Syphilis of the Heart and Blood Vessels."* Dr. Charles F. Hoover, Prof. of Medicine, Western Reserve University School of Medicine, Cleveland, Ohio.

15. *"Infectious Endocarditis."* Sir Thomas J. Horder, Bt., Prof. of Medicine, St. Bartholomew's Hospital and College, London, England.

Intermission
Review Exhibits

DIABETES—*Symposium*

16. *"The Present Status of the Diabetic Problem."* (Presentation of cases.) Dr. Rollin T. Woodyatt, Clinical Prof. of Medicine, University of Chicago School of Medicine (Rush), Chicago, Illinois.

17. *"End Results in the Treatment of Diabetes in Children."* Dr. Elliott P. Joslin, Clinical Prof. of Medicine, Harvard Medical School, Boston, Massachusetts.

EVENING SESSION
7 P.M.

18. *"Physiological Basis for the Action of Insulin."* Dr. J. J. R. Macleod, Prof. of Physiology, University of Toronto Faculty of Medicine, Toronto, Canada.

19. *"The Eye-Grounds in General Diagnosis."* Dr. George E. DeSchweinitz, Prof. of Ophthalmology, University of Pennsylvania School of Medicine, Philadelphia, Pa.

PROBLEMS OF POPULATION AND OF HEREDITY

20. *"Anomalies of Development."* Dr. Charles H. Mayo, Prof. of Surgery, University of Minnesota Graduate School of Medicine, Mayo Clinic, Rochester, Minnesota.

21. *"Mechanism of Heredity."* Edwin G. Conklin, Ph.D., Princeton University, Princeton, New Jersey.

22. *"Heredity in the Clinic."* Dr. Lewellys F. Barker, Prof. Emeritus of Medicine, Johns Hopkins University School of Medicine, Baltimore, Maryland.

23. *"Heredity and Cancer."* Mr. William Sampson Handley, F.R.C.S., Surgeon, Richard Hollin's Cancer Research School; Middlesex Hospital; Women and Children's Hospital and Guy's Hospital, London, England.

FIFTH DAY

FRIDAY, OCTOBER 22ND
7 A.M.

1. *Diagnostic Clinic (Surgical).* Mr. Archibald Young, F.R.C.S., Prof. of Surgery, University of Glasgow, Glasgow, Scotland.

2. *Diagnostic Clinic (Medical).* Dr. Lewellys F. Barker, Prof. Emeritus of Medicine, Johns Hopkins University School of Medicine, Baltimore, Maryland.

3. *Diagnostic Clinic (Surgical).* Dr. William J. Mayo, Chief of Staff, Mayo Clinic, Rochester, Minn.

4. *Diagnostic Clinic (Medical).* Sir Thomas J. Horder, Bt., Prof. of Medicine, St. Bartholomew's Hospital and College, London, England.

5. *Diagnostic Clinic (Surgical).* Mr. John M. C. Fraser, F.R.C.S., Prof. of Surgery, University of Edinburgh, Edinburgh, Scotland.

Intermission
Review Exhibits

GENITO-URINARY TRACT—*Symposium*

6. *Diagnostic Clinic and Address.* Genito-Urinary cases. *"Kidney Lesions, exclusive of Stones."* Dr. Hugh Hampton Young, Clinical Prof. of Urology, Johns Hopkins University School of Medicine, Baltimore, Maryland.

7. *Diagnostic Clinic and Address.* Bladder and prostate cases. *"Bladder and Prostate."* Dr. Hugh Cabot, Dean and Prof. of Surgery, University of Michigan School of Medicine, Ann Arbor, Michigan.

8. *Diagnostic Clinic and Address.* Cases of stones in the upper urinary tract. *"Stones in the Upper Urinary Tract."* Dr. William F. Braasch, Prof. of Urology, University of Minnesota Graduate School of Medicine, Rochester, Minnesota.

9. *"Classification of the Diseases of the Kidney from the Point of View of Progressive Treatment."* Dr .Alexander von Koranyi, Prof. of Internal Medicine, University of Budapest, Budapest, Hungary.

AFTERNOON SESSION
1 P.M.

DISEASES OF THE BREAST—*Symposium*

10. *Diagnostic Clinic and Address.* Breast cases. *"Tumors of the Breast."* Dr. John M. T. Finney, Prof. of Clinical Surgery, Johns Hopkins University School of Medicine, Baltimore, Maryland.

11. *"The Conservative Surgical Treatment of the Breast."* Dr. L. L. McArthur, Chicago, Illinois.

12. *Address in Surgery.* Mr. John M. C. Fraser, F.R.C.S., Prof. of Surgery, University of Edinburgh, Edinburgh, Scotland.

13. *"Summary of Personal Experience in the Field of Abdominal Surgery."* Dr. William J. Mayo, Chief of Staff, Mayo Clinic, Rochester, Minn.

14. *"Summary of Personal Experience in the Field of General Medicine."* Dr. James B. Herrick, Prof. of Medicine, University of Chicago School of Medicine (Rush), Chicago, Illinois.

Intermission
Review Exhibits

15. *Address in Medicine.* Dr. A. Simonena, Prof. of Medicine, University of Madrid. Madrid, Spain.

16. *Address in Surgery.* Mr. Archibald Young, F.R.C.S., Prof. of Surgery, University of Glasgow, Glasgow, Scotland.

17. *"General Therapeutic Methods for the Protection of Patients in the Extremes of Life."* Dr. C. G. Jennings, Detroit, Michigan.

18. *"Blood Transfusion; Precise, Indications, Blood Grouping, Choice of Methods."* Dr. John L. Yates, Milwaukee, Wisconsin.

19. *"Anesthesia from the Standpoint of the Surgeon."* Dr. George P. Muller, Prof. of Clinical Surgery, University of Pennsylvania School of Medicine, Philadelphia, Pennsylvania.

EVENING

BANQUET

Addresses by Distinguished Citizens of the World.

NOTE: The following is an additional list of distinguished teachers and clinicians from foreign countries who have accepted tentatively to take part on the program but have not, as yet, sent in their subjects:

Dr. Rudolf Balint, Prof. of Internal Medicine, University of Budapest, Budapest, Hungary.

Dr. M. P. Bull, Prof. of Surgery, King Frederick's University, Oslo, Norway.

Dr. Leon Cardenal, Prof. of Clinical Surgery, Universidad Central De Espana, Madrid, Spain.

Dr. A. Carnot, Prof. of Therapeutics, Faculte de Medecine, Paris, France.

Dr. J. Alves de Lima, Prof. of Surgery, University of Escolo Polytechnics, Sao Paulo, Brazil.

Dr. Geza Illyes, Prof. of Urology, Faculty of Medicine, University of Budapest, Budapest, Hungary.

Dr. Milivoie Kostitch, Prof. of Surgery, Faculty of Medicine, University of Belgrad, Belgrad, Jugo-Slavia.

Dr. Manuel Marquez, Prof. of Ophthalmology, Universidad Central De Espana, Madrid, Spain.

Mr. Herbert J. Paterson, F.R.C.S., London, England.

Dr. Luis Tamini, Prof. of Orthopedic Surgery, National University of Buenos Aires, Buenos Aires, Argentina.

Dr. Tibor de Verebely, Prof. of Surgery, Faculty of Medicine, Royal University of Budapest, Budapest, Hungary.

Physicians should make their reservations as early as possible by communication with the Hotel Cleveland or the Convention Bureau—Cleveland Chamber of Commerce.

PROGRAM COMMITTEE

Dr. George W. Crile, Cleveland, Ohio, Chairman.

Dr. Lewellys F. Barker, Baltimore, Maryland.
Dr. George E Brewer, New York, New York.
Dr. Henry A. Christian, Boston, Massachusetts.
Dr. John B. Deaver, Philadelphia, Pennsylvania.
Dr. Duncan A. L. Graham, Toronto, Canada.
Dr. James B. Herrick, Chicago, Illinois.
Dr. Jonathon C. Meakins, Montreal, Canada.
William B. Peck, Managing-Director.

NATIONAL TUBERCULOSIS ASSOCIATION

THE 22nd annual meeting of the National Tuberculosis Association will be held at the Mayflower Hotel, Washington, D. C., October 4-7, 1926.